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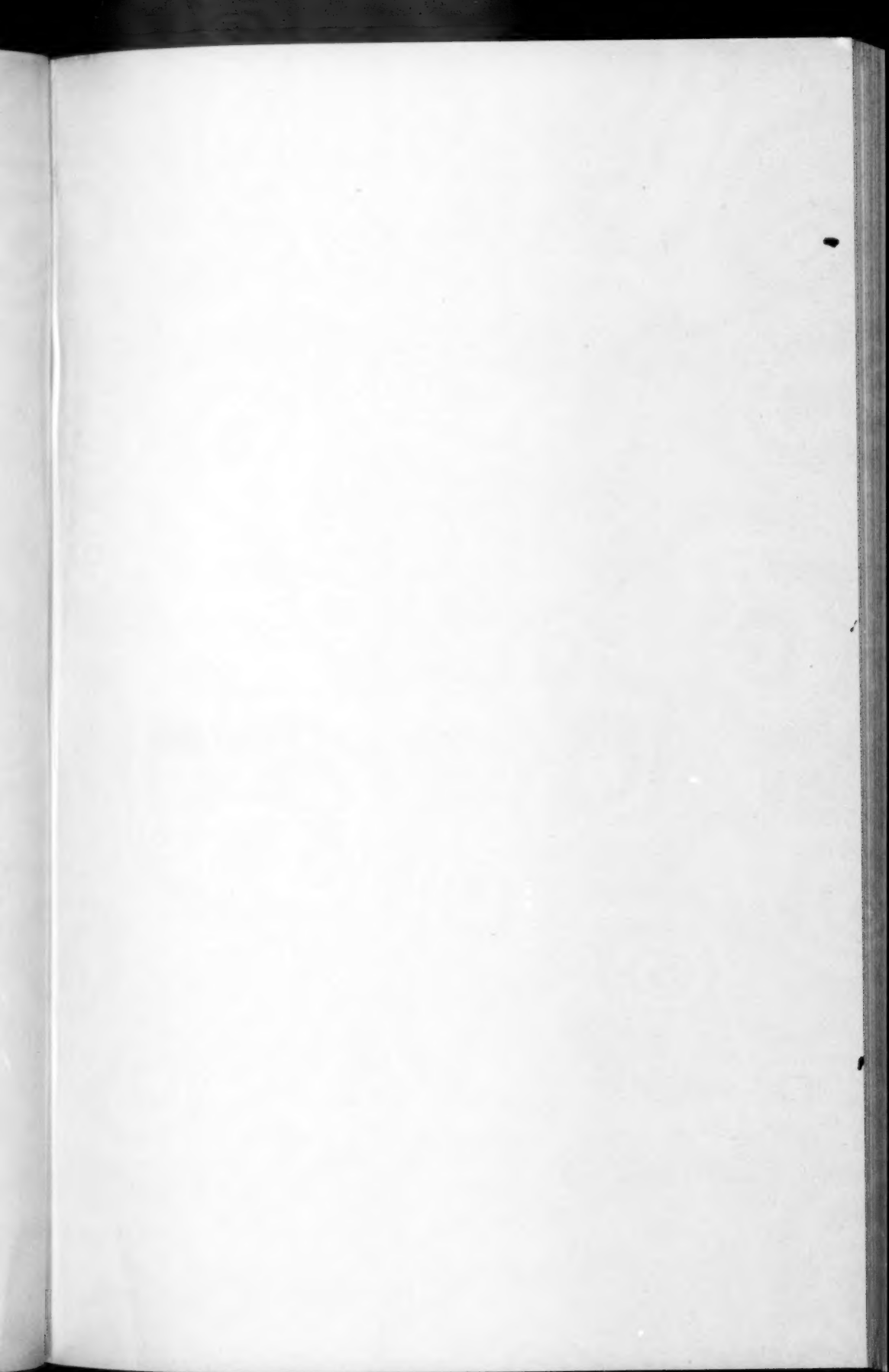
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FREMONT NATIONAL FOREST, OREGON.—(*Upper figs.*) HAGER MOUNTAIN. (*Middle fig.*) TYPICAL SCENE NEAR A WATERCOURSE; QUAKING ASPEN AND WILLOW IN FOREGROUND AND WHITE FIR AND YELLOW PINE IN BACKGROUND. (*Lower fig.*, 'U. S. Forest Service Photo') TYPICAL STAND OF YELLOW PINE.

# THE AUK

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### SUMMER BIRDS OF THE FREMONT NATIONAL FOREST, OREGON

BY THOMAS H. MCALLISTER, JR. AND DAVID B. MARSHALL

#### *Plate 9*

THIS report is an account of observations of bird life made while the authors were employed by the United States Forest Service on the Fremont National Forest from May 31 to September 2, 1943. We do not consider this to be a complete report of the birds inhabiting the Fremont Forest during the summer, since there were many areas which we never visited. Also, due to our work, we could only devote a very small part of our time to this pleasant pursuit, for we were on duty continuously the whole summer, except for several Sundays, and we had no choice as to areas. We hope, however, that there is information that will be of value and interest to others visiting this little-known region.

Fremont National Forest is situated in south-central Oregon, with its western edge in Klamath County and the rest in Lake County. Roughly, it lies south of Lapine between the Dalles California and Fremont highways, with the California border forming its southern boundary. The forest is divided into four ranger districts. In the north there is the Silver Lake District, to the south of this the Paisley District, then to the southwest the Bly District, and to the southeast the Warner District. The southern area on the Bly District is the most mountainous and receives the most moisture. The eastern area of the Silver Lake District is the most arid region, being level and frequently interspersed with rock and sage flats. The Warner District is broken by Goose Lake Valley, running north and south through Lakeview. The easternmost part of the forest appears again as a large tongue, formed by the Warner Mountains. All along the eastern edge there is a mingling of the forest and the high desert. The

altitude varies from 4,000 to 8,000 feet. The region is mostly in the Transition Life Zone, although there are areas in the Canadian and Upper Sonoran life zones. As a whole, Fremont Forest is untouched by man and has been left in its natural state. There are only a few areas that have been logged, and these only by selective logging. Except for the towns of Bly and Silver Lake, the areas in which we were stationed were many miles from human habitation.

Generally speaking, the northern part of the forest is comprised of vast stands of western yellow pine (*Pinus ponderosa*), while the southern part is of mixed western yellow pine and white fir (*Abies* sp.). In the northwestern corner, around Teatable Mountain and Sugarpine Mountain, a few sugar pines (*Pinus lambertiana*) are found. At higher elevations, white fir and lodgepole pine (*Pinus contorta*) are common, along with a few western white pine (*Pinus monticola*) and incense cedar (*Libocedrus decurrens*). On the eastern side of the Silver Lake District, around Teatable Mountain, the soil is composed of pumice and, as a result, the lodgepole pine forms large stands at lower elevations. The predominating cover of the forest floor is snow brush (*Ceanothus velutinus*) and manzanita (*Arctostaphylos* sp.). Lakes, streams, springs and other watercourses are surrounded by quaking aspens (*Populus tremuloides*) and also various forms of willows (*Salix* sp.). A great part of the area surrounding the forest and even parts within the forest contain desert and sagebrush areas. In these areas there are many forms of sage (*Artemisia*) and rabbit brush (*Chrysothamnus*). Western juniper (*Juniperus occidentalis*) is scattered along the edges of these sage lands.

Mammal life is quite abundant throughout the region. Rocky Mountain mule deer (*Odocoileus hemionus macrotus*) were seen wherever we went. Prong-horned antelope (*Antilocapra americana oregona*) and Oregon jack rabbits (*Lepus californicus wallawalla*) were found in the open or desert regions. Mountain coyotes (*Canis latrans lestes*) often serenaded us at night. The yellow-haired porcupines (*Erethizon epixanthum epixanthum*) made a general nuisance of themselves around our stations as did also the golden-mantled ground squirrel (*Callospermophilus chrysodeirus chrysodeirus*) and the western bushy-tailed wood rat (*Neotoma cinerea occidentalis*). We also found Sierra chickarees (*Sciurus douglasii albolimbatus*) and pale yellow-bellied marmots (*Marmota flaviventris avara*). One California badger (*Taxidea taxus neglecta*) and one Oregon cougar (*Felis concolor oregonensis*) were also seen by us.

McAllister was stationed in the Silver Lake Ranger District and Marshall in the Bly Ranger District. During the first part of June

we were both stationed in brush camps, where we piled slash. McAllister was at Cabin Springs and Marshall at Fishhole Mountain. In the third week McAllister was sent out on the Sycan Marsh as a guard for road equipment. From June 23 to June 26 we both took our guard training together at Dog Lake. After this, Marshall spent several days on maintenance work out of Finley Corrals. McAllister on June 28 and Marshall on July 1 were both sent to lookouts, where we spent the rest of the summer as lookout firemen.

Following are descriptions of the localities which we worked most extensively:

*Bly*, Section 3, Township 37 South, Range 14 East. Elevation, 4,356 feet. June 3 to 9, August 6 (Albert Marshall), September 2. A small logging town with marshland on the east side, and surrounded by sagebrush, western juniper and occasional western yellow pine. Bly is not within the boundaries of the forest, but is headquarters for the Bly Ranger District.

*Silver Lake*, Section 22, Township 32 South, Range 14 East. Elevation, 4,347 feet. May 31, June 10 to 14, June 19 to 23, June 27 and 28, September 2 and 3. A small town, now practically deserted. On the north side of it begins the Paulina Marsh, and on all other sides it is surrounded by sage and rims. Like Bly, it is not within the boundaries of the forest but is headquarters for the Silver Lake Ranger District. The ranger station is a mile southwest of the town, and Silver Creek, which is lined with large quaking aspen groves, runs by it.

*Dog Lake*, Section 22, Township 40 South, Range 17 East. Elevation, around 6,000 feet. June 7 and June 23 to 26. A large lake three miles long and one-fourth mile wide. The south end is mostly marshland. Timber: western yellow pine and white fir, with quaking aspen and willows surrounding the lake.

*Teatable Mountain*, Section 23, Township 27 South, Range 10 East. Elevation, around 6,500 feet. June 1 to June 10. Teatable is shaped like a mesa, for it is surrounded on all sides by high rims and on top forms a large plateau. One mile to the southwest is Cabin Springs. Timber: western yellow pine, sugar pine and lodgepole pine.

*Fishhole Mountain*, Section 20, Township 28 South, Range 16 East. Elevation, around 6,550 feet. June 8 to 23. The area covered here was between Lapham Reservoir and the top of Fishhole Mountain. It is very interesting country in that there are many small lakes scattered throughout the area surrounded by quaking aspens. Western yellow pine and white fir cover the area along with some incense cedar. Also, some of the higher slopes have stands of the curl-leaf mountain mahogany (*Cerocarpus ledifolius*).



*Sycan Marsh*, Township 32 and 31 South, Range 14 East. Elevation, 4,973 feet. June 15 to 18. A large marsh of about 9,000 acres. On the west it is bounded by large western yellow pine stands and on the east by sage flats.

*Finley Corrals*, Section 13, Township 38 South, Range 16 East. Elevation, around 6,000 feet. June 28 to July 1. Timber: western yellow pine, lodgepole pine, white fir, willows and quaking aspen.

*Coleman Point*, formerly known as Green Mountain, Section 16, Township 36 South, Range 17 East. Elevation: 7,000 feet. July 1 to August 31. Situated on the north end of Coleman Rim, Coleman Point is nine miles southeast of Gearhart Mountain. Unlike many lookout stations, this station is surrounded by heavy timber. This provided a great deal of bird life. Sierra Hermit Thrushes, Ruby-crowned Kinglets, Western Tanagers, Cassin's Purple Finches, Townsend's Solitaires and Warner Mountain Fox Sparrows provided the greatest bird chorus in the morning and evenings that one could hear anywhere. White fir is the most abundant tree; although the western yellow pine almost equals it in abundance. There are also occasional lodgepole pine, western white pine and incense cedar. Snow brush (*Ceanothus velutinus*) covers the grounds around the station.

The lookout house is perched on the highest point, from which Deadhorse Rim, Slide Mountain, the desert beyond Paisley, Round Mountain, Abert Rim, Drake's Peak, Shoestring Butte, Crane Mountain and Cougar Peak can be seen. Over all this area only two signs of man can be seen, a road far in the distance and another lookout station over ten miles away. Snow banks are found near the station into July. From Eagle Spring, which is to the west of the lookout, a branch of Deer Creek starts. Green grass, false hellebore (*Veratrum* sp., probably *viride*), and quaking aspen trees surround the spring and creek. One-half mile to the southeast of Coleman Point is the head of Spring Creek. It is in a wide canyon with the same cover as Eagle Spring but with the addition of many willows and sage. This is one of the great places for bird life around Coleman Point, but unfortunately Marshall was able to spend only several hours at this beautiful spot.

*Hager Mountain*, Section 25, Township 29 South, Range 14 East. Elevation, 7,614 feet. June 28 to September 1. A large mountain rising alone above the surrounding forest, eight miles south of Silver Lake. The slopes are covered with western yellow pine, and at higher elevations it mingles with white fir. At timberline, on the north side, is a small grove of western white pine. Above timberline, which is around 7,000 feet, is a large open area covered with sage, rabbit

brush and a few curl-leaf mountain mahogany (*Cercocarpus ledifolius*) trees. There is also a good growth of bunchgrass (*Festuca* sp.), which attracts large numbers of mule deer. Snow banks lie on top until July 18. There are two points on the summit with a saddle between. On the highest point is perched the lookout station, The view from here is without parallel. On a clear day, one may scan the Cascade skyline from Mount Shasta to Mount Jefferson. To the north lies Paulina Marsh, Fort Rock Valley, and Paulina Peak. To the east, one can look far out over the high desert to Wagontire Mountain. To the southeast stretches Winter Ridge. To the south lies Thompson Reservoir and Sycan Marsh. Beyond that one can see Horsefly, Gearhart and Slide Mountain, some of which are as much as fifty miles away. To the west and southwest lies the Klamath Indian Reservation.

To bring water up to the station was a most difficult task, for it had to be brought from Hager Spring, situated near the western foot of the mountain, over two miles of steep, rough mountain trail. On the southwest side lies another and much larger spring, which comes out of the rocks at the head of a large canyon. This is South Hager Spring. It is lined with large groves of aspen while Hager Spring has only a few willows around it. McAllister's trips to these two springs provided him with most of his records, for the barren summit of the mountain was practically devoid of bird life. Sparrow Hawks and Rock Wrens were the only inhabitants of the summit, except for occasional stragglers and migrants.

#### LIST OF BIRDS

WESTERN GREBE (*Aechmophorus occidentalis*). On June 25 we paddled into the marshes at the south end of Dog Lake and there observed several pairs of birds with young in the downy stage. We managed to catch a young one, which upon release followed the boat about as if we were its parents. On June 26 McAllister caught another young one.

PIED-BILLED GREBE (*Podilymbus podiceps podiceps*). Dog Lake, June 24. On June 26 a family of eight young was found just out of the nest.

WHITE PELICAN (*Pelecanus erythrorhynchos*). A flock of about fifty was observed on June 7 and again between June 23 and 27 at Dog Lake. Although they frequently rested in the marsh, they showed no indication of nesting. They probably came from Clear Lake which is not far distant.

FARALLON CORMORANT (*Phalacrocorax auritus albociliatus*). A few individuals were noted at Dog Lake on June 25.

TREGANZA'S HERON (*Ardea herodias treganzai*). Bly Marsh, August 6 and September 2. Antelope Flat, June 22. A common resident along Silver Creek near Paulina Marsh.

AMERICAN EGRET (*Casmerodius albus egretta*). One bird was found at the edge of the Chewaucan Marsh along the Fremont Highway, northwest of Valley Falls, June 27.

ANTHONY'S GREEN HERON (*Butorides virescens anthonyi*). One bird was discovered on Silver Creek near Silver Lake Ranger Station, June 21.

BLACK-CROWNED NIGHT HERON (*Nycticorax nycticorax hoacili*). One adult bird was observed at Dog Lake on June 25.

AMERICAN BITTERN (*Botaurus lentiginosus*). One bird was seen at Dog Lake on June 25.

COMMON CANADA GOOSE (*Branta canadensis canadensis*). Several large family groups were seen on June 25 at the south end of Dog Lake, where we also found three deserted nests on tule islands, which had clutches of unmolested eggs. On June 27 McAllister saw several family groups along the Fremont Highway at the edge of Summer Lake. The settlers at Silver Lake said they bred regularly on Paulina Marsh.

COMMON MALLARD (*Anas platyrhynchos platyrhynchos*). First seen at Antelope Flat on May 31 and from then on throughout the summer at Dog Lake, Fishhole Mountain, Paulina Marsh, Summer Lake, Silver Creek and Johnson Meadows. From this it may be seen that they breed commonly throughout the region, wherever conditions are suitable. On June 20 Marshall flushed a female from a nest on the side of Fishhole Mountain about seventy-five feet from a small, deep pond. The nest was on the ground next to a rotten log beneath a small white fir, and was lined with down and needles and contained three eggs. It is interesting to note that the pond contained no shallow water; the edge was a straight drop. Also, there was no vegetation around the pond except for the trees.

GADWALL (*Chaulelasmus streperus*). On June 25 we flushed a number of these ducks from the heavy cover of a tule island at the south end of Dog Lake, and found two nests. They contained eight and nine eggs, respectively, and were lined with down and grasses. On June 26 McAllister flushed a Gadwall off a nest containing five dark cream eggs and four of her own, which were smaller and creamy white. She had probably been imposed upon by a Redhead, as is so often the case.

CINNAMON TEAL (*Anas cyanoptera cyanoptera*). We found this the most abundant duck on June 24 at Dog Lake.

REDHEAD (*Nyroca americana*). Several pairs were seen at Dog Lake on June 24.

RUDDY DUCK (*Erismatura jamaicensis rubida*). Two pairs were noted at Dog Lake on June 25.

TURKEY VULTURE (*Cathartes aura septentrionalis*). Individuals were observed throughout the forest from June 5 at Bly to August 28 at Coleman Point.

SHARP-SHINNED HAWK (*Accipiter striatus velox*). Hager Mountain, August 7 and Coleman Point, August 26. On August 21 Marshall saw one being chased by a flock of Robins at Spring Creek, half a mile southeast of Coleman Point.

COOPER'S HAWK (*Accipiter cooperii*). A pair flew over Hager Mountain on August 31 and September 1.

WESTERN RED-TAILED HAWK (*Buteo borealis calurus*). Individuals were observed throughout the forest from June 5 at Bly until August 28 at Coleman Point. On August 7 the first numbers of apparently migratory birds were noted over Hager Mountain.

SWAINSON'S HAWK (*Buteo swainsoni*). One bird was seen over Hager Mountain on August 9.

FERRUGINOUS ROUGH-LEG (*Buteo regalis*). Three individuals spent August 10 hunting over Hager Mountain from which they went on to the southward.

During August, McAllister frequently saw buteos in phases which he could not identify. Although Hager Mountain is ideally suited for hawks, he did not observe

any but Sparrow Hawks until the first week of August. From this he concluded that all the hawks he saw constituted the first of an early, light, fall migration.

**GOLDEN EAGLE** (*Aquila chrysaetos canadensis*). Two adults and two immature birds worked irregularly over Hager Mountain from June 12 to the end of July.

**NORTHERN BALD EAGLE** (*Haliaeetus leucocephalus washingtoniensis*). Two adults circled over Dead Indian Lookout on June 14. One adult near Bly on August 6.

**MARSH HAWK** (*Circus cyaneus hudsonius*). Hager Mountain, July 19 and August 9 to August 26. It was surprising for the first time to see Marsh Hawks flying over Hager, but they appeared intermittently throughout August, individually and in pairs. Sometimes they glided and flapped low over the summit of the mountain most of the day, alighting at intervals to rest on old snags, or else they drifted by in a southerly direction. On August 10, at Coleman Point, a Marsh Hawk spent the day in a similar fashion. The only time they were seen in customary surroundings was at Bly Marsh on August 6 by Albert Marshall.

**PRAIRIE FALCON** (*Falco mexicanus*). At Antelope Flat, on June, 10, two birds were seen along the rimrock where they probably nest. One bird worked around Hager Mountain on August 20.

**WESTERN PIGEON HAWK** (*Falco columbarius bendirei*). One bird joined company with the Sparrow Hawks on Hager Mountain on August 11, and caught dragonflies in the same fashion as they did.

**EASTERN SPARROW HAWK** (*Falco sparverius sparverius*). Noted throughout the forest between May 31 at Antelope Flat and September 1 at Hager Mountain. On Hager there were as many as three pairs, one of which bred on the side of the mountain in an old hollow snag. They were extremely audacious and chased everything from the Golden Eagle to the Prairie Falcon. Their chief food throughout August was a large dragonfly which swarmed over the mountain on hot days. They would neatly catch and devour the dragonflies on the wing without alighting.

**SIERRA GROUSE** (*Dendragapus obscurus sierrae*). A common resident on both Hager Mountain and Coleman Point. First observed on June 12 and last seen September 1 on Hager. On July 20, at Hager, an old hen, which was so tame as to allow one to walk up and all but touch her, brought her family of half-grown young up the mountain, and spent the rest of the summer on the summit.

**SAGE HEN** (*Centrocercus urophasianus*). Flocks were seen in the sage south of Silver Lake on June 11 and August 21.

**SANDHILL CRANE** (*Grus canadensis tabida*). On June 16, while camped on the edge of Sycan Marsh, McAllister heard a number of these birds calling in the evening. The birds are well known to the settlers in this region, who said they were also found on Seller's Marsh and Klamath Marsh.

**AMERICAN COOT** (*Fulica americana americana*). First seen at Dog Lake on June 7. Later, on June 25 at Dog Lake, a family of young coots was seen on the lake, and a nest of eight eggs was found.

**KILLDEER** (*Charadrius vociferus vociferus*). First seen May 31 at Antelope Flat. McAllister, while driving a truck near Thompson Reservoir on June 11, noticed a mother frantically 'playing injured' just in front of the truck, which he stopped in time to see a family of baby Killdeers scurry out of the ruts in the road. They were just out of the nest and he managed to catch one. Also noted at Bly on June 5 and August 6 and at Fishhole Mountain on June 12.

**WILSON'S SNIBE** (*Capella delicata*). Bly Marsh, June 3. Winnowing at evening on Dog Lake, June 25.

**SPOTTED SANDPIPER** (*Actitis macularia*). Fishhole Mountain, June 13; Lapham Reservoir, June 20; and Dog Lake, June 24.



WESTERN WILLET (*Catoptrophorus semipalmatus inornatus*). Numerous about Bly between June 3 and June 8, and Sycan Marsh, June 15 to 18. We were both surprised to see them playing about in the sage and junipers as far as a mile from water. It was amusing to see them teeter crazily, as they tried to alight in the slender top of a juniper.

WILSON'S PHALROPE (*Steganopus tricolor*). Several pairs were seen at Dog Lake on June 24, which were breeding near the Black Tern colony.

CALIFORNIA OF RING-BILLED GULL (*Larus californicus* or *L. delawarensis*). A few at Dog Lake on June 24. On July 22 a gull flew over Hager Mountain Lookout going due north.

FORSTER'S TERN (*Sterna forsteri*). One bird was seen at Drew's Reservoir on June 26. Bly Marsh, August 6.

BLACK TERN (*Chlidonias nigra surinamensis*). Common on Sycan Marsh, June 16 and Dog Lake, June 25. At Dog Lake there were nests scattered about on small tule islands. We found one with two downy young and another with a dead young and an egg. The other nests were slightly raised platforms of grass and tule, six inches in diameter, and in one inch of water.

WESTERN MOURNING DOVE (*Zenaidura macroura marginella*). This bird was seen in small numbers on meadows and flats throughout the region between May 31 at Antelope Flat and September 1 at Silver Lake.

PACIFIC HORNED OWL (*Bubo virginianus pacificus*). Fishhole Mountain, June 11 and June 20. Finley Corrals, June 30. Coleman Point July 3 and August 1. Hager Mountain, August 27.

NUTTALL'S POOR-WILL (*Phalaenoptilus nuttalli nuttalli*). First heard at evening east of Sycan Marsh on June 15. Heard regularly over Hager Mountain between June 28 and August 31.

PACIFIC NIGHTHAWK (*Chordeiles minor hesperis*). Dog Lake, June 7 and 24. Sycan Marsh, June 15.

VAUX'S SWIFT (*Chaetura vauxi*). Flocks were observed at Finley Corrals on June 28 and July 31. On Coleman Point, Marshall saw these birds two or three times a week between July 2 and August 26, but never more than two or three at a time. At Eagle Spring, just below Coleman, however, a flock of nineteen was seen on August 26.

RUFous HUMMINGBIRD (*Selasphorus rufus*). On September 2, the matrimonial or desert vine around the Silver Lake Ranger Station was alive with Rufous Hummingbirds. The surprising thing was that there were no males among these birds.

CALLIOPE HUMMINGBIRD (*Stellula calliope*). First seen at Coleman Point on July 3, and from then on, frequently throughout the summer, until August 24. One once flew inside the lookout station through an open window, hovered in the middle of the room, and then darted out the only other open window in the station on the opposite side of the room. Also, a female was seen at Hager Spring, and another at South Hager Spring which spent July and August there. At Hager Spring, one was observed taking a bath. It would gently lower itself and hit the surface of the pool like a tiny helicopter, and repeat this performance until sufficiently wet. At no time during the summer were male Calliope Hummingbirds seen; all were females.

WESTERN BELTED KINGFISHER (*Megasceryle alcyon caurina*). Silver Creek, September 2.

RED-SHAPED FLICKER (*Colaptes cafer collaris*). Found commonly throughout the forest between June 1 at Cabin Springs and September 1 on Hager Mountain. Two pairs nested in old white-fir snags on Hager Mountain.



WESTERN PILEATED WOODPECKER (*Ceophloeus pileatus picinus*). Seen occasionally on Coleman Point from June 3 to August 16.

LEWIS'S WOODPECKER (*Asyndesmus lewis*). Bly, June 6. This species was found nesting high in an old yellow pine near Sycan Marsh, June 17.

RED-NAPED SAPSUCKER (*Sphyrapicus varius nuchalis*). One bird was observed in an aspen grove on Silver Creek, June 20.

WILLIAMSON'S SAPSUCKER (*Sphyrapicus thyroideus thyroideus*). Very common on Coleman Point from July 4 to August 31. Sometimes two pairs could be seen on one tree. They were, however, seen only sparingly on Hager Mountain. On July 10, Marshall found a nest forty-five feet up in the dead top of a white fir. Young could be heard calling from the hole. These birds are very quiet and secretive. Very seldom were their calls ever heard.

MODOC WOODPECKER (*Dryobates villosus orius*). Found throughout the forest between June 4 on Teatable Mountain and September 1 on Hager Mountain.

NORTHERN WHITE-HEADED WOODPECKER (*Dryobates albolarvatus albolarvatus*). Lantern Flat, a large flat east of Finley Corrals, July 1. Coleman Point, July 7 and August 3.

ARCTIC THREE-TOED WOODPECKER (*Picoides arcticus*). Fishhole Mountain, June 13, 20 and 23.

EASTERN KINGBIRD (*Tyrannus tyrannus*). One bird was calling lustily in the timber on Hager Mountain, July 15.

ARKANSAS KINGBIRD (*Tyrannus verticalis*). Bly, June 3 through June 6, and August 6. Silver Lake, May 31 and June 13.

SAY'S PHOEBE (*Sayornis saya saya*). Silver Lake, May 31.

LITTLE FLYCATCHER (*Empidonax traillii brewsteri*). First seen at Finley Corrals on July 1. Later seen at South Hager Spring, Coleman Point and Spring Creek. Last seen August 26 on Spring Creek.

HAMMOND and WRIGHT'S FLYCATCHERS (*Empidonax hammondi* and *E. wrighti*). These little flycatchers were abundant from June 2 at Cabin Springs to September 2 at Finley Corrals. Because of their close similarity we never knew whether we were seeing *hammondi* or *wrighti*, although we presume that most of them were of the former species, since by far the majority were found fairly high up in the heavy timber. Wherever we went, these birds were always heard calling from the timber, even on warm afternoons, when everything else was still.

WESTERN FLYCATCHER (*Empidonax difficilis difficilis*). Fishhole Mountain, June 14, and Hager Spring, August 10.

WESTERN WOOD PEWEE (*Myiochanes richardsoni richardsoni*). A common resident throughout the forest from June 6 at Bly and Teatable Mountain to September 2 at Finley Corrals.

OLIVE-SIDED FLYCATCHER (*Nuttallornis mesoleucus*). First seen on Teatable Mountain on June 6. Later observed at Fishhole Mountain and Finley Corrals. Last seen at Coleman Point on August 26.

VIOLET-GREEN SWALLOW (*Tachycineta thalassina lepida*). On July 11, a few birds flew over Hager Mountain.

TREE SWALLOW (*Iridoprocne bicolor*). First seen at Bly on June 5. Later seen at Thompson Reservoir and Fishhole Mountain. Last seen at Dog Lake on June 25.

BARN SWALLOW (*Hirundo erythrogaster*). First seen at Bly on June 3. Later seen at Dog Lake and Thompson Reservoir. Last seen on August 8, when a small flock flew over Hager Mountain.

NORTHERN CLIFF SWALLOW (*Petrochelidon pyrrhonota pyrrhonota*). Dog Lake, June 7.

GRAY JAY (*Perisoreus canadensis griseus*). First seen at Cabin Springs on June 5, where they came regularly to be fed flapjacks. Also observed at Fishhole Mountain and Finley Corrals. At Coleman Point they were seen often from July 2 up to the time Marshall left on August 31, and were quite fond of the suet that was put out for them.

BLUE-FRONTED JAY (*Cyanocitta stelleri frontalis*). Found throughout the forest from June 6 at Bly to August 26 on Coleman Point.

AMERICAN MAGPIE (*Pica pica hudsonia*). First seen near Paulina Marsh on May 31. Later seen at Bly and Dog Lake. Last seen at Silver Lake on September 2.

AMERICAN RAVEN (*Corvus corax sinuatus*). First seen at Dog Lake on June 7. Later seen at Fishhole Mountain and Hager Mountain. Last seen at Coleman Point on August 24. On the few occasions that we saw these birds from our lookouts, they were in large flocks which would circle and drift above us, sometimes continuing this for long periods of time.

CLARK'S NUTCRACKER (*Nucifraga columbiana*). Large numbers were at Shelvin on June 2. Small flocks on Coleman Point and Hager Mountain up to September 1 at Hager.

SHORT-TAILED CHICKADEE (*Parus gambeli abbreviatus*). Found to be an abundant resident over the entire forest from June 1 at Cabin Springs to September 1 at Hager Mountain. On June 12 at Fishhole Mountain, Marshall found chickadees carrying nesting material into a yellow pine log three feet in diameter, which was lying flat on the ground. The entrance was a crack in the log, one foot from the ground.

ROCKY MOUNTAIN NUTHATCH (*Sitta carolinensis nelsoni*). Fairly common in all forest areas from June 6 at Bly to September 1 on Hager Mountain.

RED-BREASTED NUTHATCH (*Sitta canadensis*). Common in all forest areas from June 1 at Cabin Springs to August 31 on Coleman Point. Especially abundant at high elevations.

BLACK-EARED NUTHATCH (*Sitta pygmaea melanotis*). First seen at Thompson Reservoir on June 11. Last seen on Coleman Point on July 31. This bird was abundant in the northern part of the forest, where there are solid stands of yellow pine, but only occasional in the southern part, where the timber is only partly yellow pine.

SIERRA CREEPER (*Certhia familiaris selotes*). Seen throughout the forest between June 6 at Teatable Mountain and September 1 on Hager Mountain. On July 3 at Hager, McAllister watched a pair taking food to their young. The nest was in a bark crevice thirty feet up in an old yellow-pine snag.

WESTERN HOUSE WREN (*Troglodytes aëdon parkmanii*). First seen on June 6 at Bly and Teatable Mountain. Other individuals noted at Dog Lake, Fishhole Mountain and Coleman Point. The aspens at Spring Creek on August 26 were alive with them. Also, large numbers appeared in the brush at Hager Mountain on August 27, where they had not been previously noted. These two records would indicate a migration.

WESTERN MARSH WREN (*Telmatochlamys palustris plesius*). Dog Lake, June 25.

CAÑON WREN (*Catherpes mexicanus conspersus*). One adult bird came in on August 20 during a heavy morning fog and spent the day about Hager Mountain lookout station. On August 23 an adult spent the morning around Coleman Point Lookout. It continually gave a ringing call that could be heard from a great distance. Both birds offered an excellent chance for observation as they were quite tame.

COMMON ROCK WREN (*Salpinctes obsoletus obsoletus*). First seen at Bly on June 3. Also found at Dog Lake and Silver Lake. On Hager Mountain they were abundant

among the rocks and brush above timberline. Except for stragglers and the Sparrow Hawks, they were the only birds which inhabited the mountain top. Last seen at Hager on September 1.

SAGE THRASHER (*Oreoscoptes montanus*). Silver Lake, June 12.

WESTERN ROBIN (*Turdus migratorius propinquus*). Found throughout the region from June 3 at Bly to September 1 on Hager Mountain.

SIERRA HERMIT THRUSH (*Hylocichla guttata sequoiensis*). Found throughout the forest from June 1 at Cabin Springs to August 30 on Coleman Point. Not until the woods at evening echoed with their songs, did one fully realize the abundance of this shy bird.

TOWNSEND'S SOLITAIRE (*Myadestes townsendi*). Noted throughout the forest from June 13 at Fishhole Mountain to August 17 on Coleman Point. Sometimes one would never know that this bird existed until the solitaires from all around would go to the tops of the firs and all begin singing at once. On August 16, McAllister watched parents feeding berries to spotted young at South Hager Spring.

MOUNTAIN BLUEBIRD (*Sialia currucoides*). Seen in more open country at lower elevations. First noted on June 5 near Euwana Camp on Quartz Mountain. Later noted at Bly, Bear Flat and Dog Lake. Last seen at Finley Corrals on July 1.

WESTERN GOLDEN-CROWNED KINGLET (*Regulus satrapa olivaceus*). Flocks were frequently seen from June 1 at Cabin Springs to September 1 on Hager Mountain.

WESTERN RUBY-CROWNED KINGLET (*Regulus calendula cineraceus*). One of the common birds in the forest from May 31 at Silver Lake to August 30 on Coleman Point. During June and July the forest was constantly filled with their singing.

WESTERN PIPIT (*Anthus spinoletta pacificus*). A few birds flew over the summit of Hager Mountain on September 1.

CALIFORNIA SHRIKE (*Lanius ludovicianus gambeli*). One bird was noted near Dog Lake on June 7.

CASSIN'S VIREO (*Vireo solitarius cassinii*). First noted at Bly on June 6 and last noted at Spring Creek on August 26. Other individuals seen at Dog Lake, Fishhole Mountain, Coleman Point and South Hager Spring.

WESTERN WARBLING VIREO (*Vireo gilvus swainsonii*). Found in aspens and willows along most of the watercourses from May 31 at Silver Lake to August 29 at Eagle Spring near Coleman Point.

ROCKY MOUNTAIN ORANGE-CROWNED WARBLER (*Vermivora celata orestera*). Numerous in aspens at South Hager Spring on August 19 and 23, and among the willows at Spring Creek on August 21 and 26.

ROCKY MOUNTAIN YELLOW WARBLER (*Dendroica aestiva morcomi*). Found along watercourses in the willows and aspens, and in shade trees about ranches and towns from May 31 at Silver Lake to September 2 at Silver Lake.

AUDUBON'S WARBLER (*Dendroica auduboni auduboni*). A common forest resident, especially at higher elevations, from June 1 at Cabin Springs to September 1 on Hager Mountain.

BLACK-THROATED GRAY WARBLER (*Dendroica nigrescens*). One individual at Hager Spring on August 20.

TOWNSEND'S WARBLER (*Dendroica townsendi*). Several noted at South Hager Spring on August 23 and at Spring Creek on August 26. One appeared among a flock of Audubon Warblers at Coleman Point on August 20.

MACGILLIVRAY'S WARBLER (*Oporornis tolmiei*). Numerous at Spring Creek on August 26 and at South Hager Spring between August 19 and August 23. A few were also noted at Coleman Point on August 14 and 17 and at timberline on Hager Mountain on August 18.

WESTERN YELLOW-THROAT (*Geothlypis trichas occidentalis*). A few were present at Dog Lake on June 23.

NORTHERN PILEOLATED WARBLER (*Wilsonia pusilla chryseola*). Noted at Finley Corrals on June 28, timberline on Hager Mountain on August 18, South Hager Spring between August 19 and August 23, and at Spring Creek on August 26.

ENGLISH SPARROW (*Passer domesticus domesticus*). Seen about Bly and Lakeview.

WESTERN MEADOWLARK (*Sturnella neglecta*). Bly, June 3, and Drew's Reservoir, June 26.

YELLOW-HEADED BLACKBIRD (*Xanthocephalus xanthocephalus*). A small colony was found at Dog Lake on June 25, where a nest was discovered in the tules one and one-half feet above the water. It contained two eggs and two newly hatched young.

NEVADA RED-WING (*Agelaius phoeniceus nevadensis*). Common at all the marshes we visited from June 3 at Bly to September 2 at Bly.

BULLOCK'S ORIOLE (*Icterus bullockii*). Common between May 31 and June 21 among the aspens along Silver Creek near Silver Lake, where several nests were found.

BREWER'S BLACKBIRD (*Euphagus cyanocephalus*). First seen at Silver Lake on May 31 and last seen at Bly on September 2. Also noted at the Lapham Reservoir, Paisley, Lakeview and at Dog Lake, where a nest was found on June 24 at the edge of the lake. It was concealed on the ground in the grass and weed-cover, six inches high, and contained five eggs.

WESTERN TANAGER (*Piranga ludoviciana*). Very common throughout the forest between June 2 at Shelvin to August 31 on Coleman Point. At Shelvin, a large logging camp where they were especially numerous, they were found foraging about the streets and dooryards in company with large flocks of Clark's Nutcrackers. This apparently went on with a great deal of success, as there was plenty of refuse. At Coleman Point, also, they became very tame, and often came to the door of the station after eggshells that had been thrown out.

WESTERN EVENING GROSBIRD (*Hesperiphona vespertina brooksi*). Flocks were seen at Fishhole Mountain on June 20, Finley Corrals on June 28, and a few at Hager Mountain on July 12. Noted frequently from July 2 to August 20 on Coleman Point. One immature bird flew against the window of the Coleman Point station on August 20. It then rested for several minutes on the guy cable, and later in the afternoon repeated this performance for a second and third time. On the third occasion, Marshall held a soda cracker out to the bird and it took several nips at it, apparently tasting the salt on it, as it did not break off and eat any of the cracker. The bird then flew off, but late that afternoon it again flew against a window. This time, though, it flew off when Marshall approached it with some salt. The bird apparently came in with a flock that spent the early morning around Coleman Point but remained instead of leaving with the others.

CASSIN'S PURPLE FINCH (*Carpodacus cassinii*). Observed through the summer, first at Dog Lake on June 7, later at Fishhole Mountain, Finley Corrals, South Hager Spring, and last at Coleman Point on August 27.

COMMON HOUSE FINCH (*Carpodacus mexicanus frontalis*). Seen about Bly from June 3 to 7, and at Paisley and Lakeview on June 26.

NORTHERN PINE SISKIN (*Spinus pinus pinus*). First seen at Bly on June 3, then at Finley Corrals on July 1, and from then on frequently on Coleman Point up to August 26. Only a small flock was noted at Hager Mountain on July 12.

BENDIRE'S CROSSBILL (*Loxia curvirostra bendirei*). Flocks were seen regularly on Coleman Point from July 3 to August 18. Also noted at Dog Lake on June 24 and at Hager Mountain on August 18.



GREEN-TAILED TOWHEE (*Oberholseria chlorura*). Noted abundantly at Bly on June 6, the summit of Fishhole Mountain on June 20, Dog Lake July 24, and Spring Creek on August 26. Found from June 28 to September 1 around timberline on Hager Mountain.

NEVADA SAVANNAH SPARROW (*Passerculus sandwichensis nevadensis*). Bly, June 30.

NORTHERN SAGE SPARROW (*Amphispiza belli nevadensis*). Common about Silver Lake from May 31 to September 2.

THURBER'S JUNCO (*Junco oreganus thurberi*). Found throughout the forest from May 31 at Cabin Springs to September 1 on Hager Mountain.

WESTERN CHIPPING SPARROW (*Spizella passerina arizonae*). Noted from June 6 at Bly to August 26 at Spring Creek.

BREWER'S SPARROW (*Spizella breweri breweri*). First noted at Bly on June 6 and then at Silver Lake. Last seen on June 16 on the east side of the Sycan Marsh, where a nest with four eggs was found in the sage.

OREGON WHITE-CROWNED SPARROW (*Zonotrichia leucophrys oriantha*). Seen at Finley Corrals from June 28 to July 1 and again on July 17. One immature bird at Spring Creek on August 21, and a number of adults and several immatures seen at Spring Creek on August 26.

WARNER MOUNTAINS FOX SPARROW (*Passerella iliaca fulva*). Found throughout the forest from June 6 at Teatable Mountain to August 30 on Coleman Point. Near Fishhole Mountain, a partially albinistic bird was seen on June 20.

LINCOLN'S SPARROW (*Melospiza lincolni lincolni*). Noted at Finley Corrals from June 28 to July 1, and again on July 29. One individual was seen at Spring Creek on August 26.

MODOC SONG SPARROW (*Melospiza melodia fisherella*). Noted along water-courses in willows and aspens throughout the area from May 31 at Silver Lake to September 2 at Silver Lake.

#### Portland

#### Oregon

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## A STUDY OF THE NESTING ACTIVITIES OF THE AMERICAN REDSTART<sup>1</sup>

BY LOUIS STURM

### INTRODUCTION

ALTHOUGH the Redstart (*Setophaga ruticilla*) is one of the common warblers with a wide range throughout the northeastern United States and Canada, its life history, like that of many common birds, has received relatively little attention from investigators. Since Chapman's (1917: 287-295) summary account, Hickey (1940: 254) has described the territorial behavior and display flight of the males, and Mousley (1924: 284-288) and Baker (1944: 83-90) have given short accounts of the nesting behavior. The following study was made on

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<sup>1</sup> Contribution from Franz Theodore Stone Laboratory, Ohio State University, Put-in-Bay, Ohio.



South Bass Island in western Lake Erie where data were collected during the summers of 1940, 1941, and 1942. An attempt was made to secure as complete and accurate information as possible from a few nests, and special emphasis was placed on attentiveness and the rôle of the sexes during incubation and feeding of the young. Of a total of about 250 hours of observation, 213 were devoted to two nests.

Rates and percentages of various activities referred to in this paper are based on the time between the first and last occurrence of such activities, not on the total period of observation. The attentive periods referred to represent the actual time spent at the nest by the adults (Pitelka, 1941: 609). The equipment used included an eight-power binocular, notebook, watch, canvas blind, and a mirror mounted on a nine-foot bamboo pole.

#### NESTING AREA

The site of this nesting area is in the Peach Point region of South Bass Island. It is divided into two distinct sections, one east and the other west of an apple orchard, the borders of which were used by the Redstart.

The section east of the orchard consists of 1.4 acres of second-growth woodland. The dominant trees are sugar maple, basswood, hackberry, black cherry, and elm. The undergrowth consists of stag-horn sumac, hop tree (*Ptelea*), and saplings of maple, elm, and hackberry. In places the trees are matted together with wild grape, bittersweet, and woodbine. A few scattered red cedars, which are fast being crowded out, and the sumacs, most of which are dead except along the borders, doubtless represent the early invaders of a cleared field or pasture.

The second section is a small triangular area that includes the northwest corner of the orchard and a part of the eastern edge of another rather large wood. In the corner of the orchard are a few large trees; otherwise the vegetation is much the same as that of the first section. The orchard and the wood are separated by a footpath. It was along this path that the greater part of the study was made in 1942.

Other species of birds with which the area was shared were: the Red-eyed Vireo, Wood Pewee, Carolina Wren, Downy Woodpecker and Crested Flycatcher.

#### TERRITORIES

Although I had no opportunity to observe either the establishment of territories or courtship, the behavior of the birds during nest building

and later stages of the breeding cycle agrees with Type A (Nice, 1941: 457) except that territorial boundaries are seldom defended by the time the young are ready to leave the nest.

The territory-establishing behavior of the Redstart has been described by Hickey (1940: 255-256). A similar behavior during nest life was noted in this study.

During nest building and incubation, the male sang almost incessantly. Counts of the number of songs were made at intervals throughout the observation at the nest, both in the morning and in the afternoon, and the average number of songs per minute was 9.6 for short intervals of active singing. During the afternoon of June 29, the sixth day of incubation, the male sang 370 times in one hour; this was an average of 6.2 songs per minute. The morning of June 30 he sang 379 times per hour or 6.5 songs per minute, a rate which was equaled again on July 3.

The male continued to sing during the nestling period, and on 92 different occasions sang at the nest immediately after feeding the young. Mousley (1924: 267-268) observed a similar behavior in the Parula Warbler. He also noted that the male Parula sang with food in his mouth—an activity noted in the Redstart on the second and third day after the eggs had hatched, July 6 and 7.

The male was aggressive toward other male Redstarts. On four different dates he was observed to attack males, and on one of these occasions, during an hour devoted especially to watching this bird, he chased five intruders. To other species he was usually tolerant. Vireos fed almost every day in a near-by cherry tree and on only one occasion, July 6, was he observed to give chase. Carolina Wrens came to the blind, which was about five feet from the nest; Robins, Song Sparrows and a Junco hopped around under the nest tree at different times without being disturbed; but on the afternoon of June 24, when a female Yellow Warbler alighted on a limb near the blind, she was promptly attacked by the male bird, and on June 27 he assisted a male Indigo Bunting in routing a Cowbird. He was never observed to chase a female Redstart, but on July 2 he followed one out of the territory, after watching her feed in a near-by cherry tree.

The female also aided in protecting the territory. Twice on the morning of July 3 and once on the afternoon of July 8 she chased female Redstart intruders, and on June 29 and July 1 she attacked intruding males by flying at them and snapping her beak vigorously. She was always very alert when other species were near, but did not leave the nest to give chase.

The observed territories were smaller than those reported by Hickey

(1940: 256), which averaged one-half to one acre in extent, and were also smaller than those indicated for the species in any breeding-bird census (Hickey, 1941). In 1940, in the northwest corner of the orchard mentioned above, there were six nesting territories. Assuming a complete utilization of this area of 1.43 acres, each territory averaged 0.24 acre. In the eastern section, which contained 1.4 acres, on May 31 and June 1, 1941, nine nesting territories were found with the nests either complete or in the process of construction. These had an average area of 0.16 acre. In 1942, in the same section, there were six territories with an average of 0.23 acre. The boundaries of territory no. 7-42 were definitely known and measured and the territory was found to contain originally 0.14 acre, but after the first change of boundary it covered 0.19 acre. Although no comparable data are available for other areas on South Bass Island, it is my impression that this density is exceptionally high and that it would not be equalled in the larger and more mature forest areas. In the area under study the Redstart was by far the most numerous nesting bird. No other warblers nest in the area, excepting Yellow Warblers which are largely confined to the margins of the woodland and to the orchard.

Territorial boundaries, however, were not permanently established. Two instances of shifting were noted in connection with nest no. 7-42. The first change was during nest building, after the boundaries of two territories were seemingly well established. Female no. 7-42 began getting material from a deserted nest in an oak about twenty-five feet inside the adjoining territory, no. 6-42. On her first trip she was not challenged. On later trips she was chased frequently by female no. 6, and this eventually led to a general fight involving both males and both females—male against male and female against female. During the remainder of the afternoon, when female no. 7 went into territory no. 6, she gave two or three 'cheeps' before flying to the oak, and each time her mate came and followed her, flying in the same general direction and waiting until she returned. Late in the afternoon, the pair from territory no. 7 became involved with two males in a fight near the oak. This fight seemed to settle the question of boundary, for subsequently female no. 7 went back and forth more or less freely.

The second change of territorial boundaries was due to the introduction of a bird bath, fifteen feet from the base of the nest tree and about ten feet north of the southern boundary of the territory. It was promptly discovered and used by male and female no. 7-42 but there were no other observed visitors until July 1 when a strange female Redstart came unmolested. In the afternoon, the male bathed and his mate joined him. Later the same day female no. 7 and another

female Redstart bathed amicably together. Red-eyed Vireos, Carolina Wrens, Robins, Song Sparrows, Indigo Buntings, Juncos, and other Redstarts came to the bath unmolested. On July 3, there were four species at the bath at one time; a Song Sparrow, Carolina Wren, Vireo, and Redstart. Birds, including male and female Redstarts, could sit on the fence south of the bath without being disturbed but were promptly chased if they came a little beyond it.

The territorial boundaries were defended less frequently as the nestlings grew older. For example, on July 4, when a strange Redstart fledgling fluttered noisily to the fence near the nest tree and was followed by its parents, neither male nor female no. 7-42 gave the invaders any attention. The last observed instance of aggressive behavior was on July 8, the fourth day after hatching, when female no. 7-42 attacked an intruding female. On July 10, when a strange female came to a limb near the nest and fed, she was not attacked. Lack of territorial defense while adults were engaged in feeding young was also noted by Baker (1944: 84).

#### NEST BUILDING AND NEST SITES

In 1940, three nests in the process of construction were found on June 18. In view of the late date and the absence of fledged young, it seems probable that these represented re-nestings after unsuccessful earlier attempts. Most of the nests for this year were completed by June 23. The first nests of 1941 were found on May 21, and there were no data on the completion of the last nests. In 1942, one completed nest and one in the process of construction were observed on June 5 by Dr. Charles Walker. Most of the nests were completed by June 18 and the last nest for which we have records was completed June 22 or 23.

The nests, like those described by Sutton (1928: 223), were ordinarily built in small saplings or shrubs where there were upright forked branches, usually at least three in number. Of the twenty nests studied, nine were between ten and fifteen feet above ground; the lowest was three feet from the ground and the highest, twenty-five feet.

The construction or partial construction of three nests was observed. The building was done exclusively by the female. The male sometimes followed her as she gathered nest material but at no time did he assist with building as did the Black-throated Green Warbler watched by Pitelka (1940: 5) and the Prothonotary Warbler studied by Walkinshaw (1938: 38; 1941: 4).

Female no. 7-42 was observed to make 517 trips to the nest with



building material in twenty-seven hours, or an average of nineteen trips per hour. It took this bird between two and one-half and three days to construct the nest, and on the second day she made trips almost continuously for fourteen and one-half hours. Assuming that the bird began work on the morning of June 17, she worked about thirty-six hours and made between 650 and 700 trips in building the nest. The materials were collected from the ground in the territory and from a deserted nest in an oak about ninety feet away.

#### EGG LAYING

Nest no. 3-40 was completed on June 21 and the first egg was laid on June 22; the second, early in the morning of June 23 and the third and last on June 24.

Nest no. 7-42 was completed during the morning of June 19 and the first egg was found the morning of June 21 (the laying of the rest of the complement was observed from a blind). The second egg was laid on June 22 at 5:00 A. M.; the third, June 23 at 5:12 A. M.; the fourth and last, June 24 at 5:03 A. M. Apparently the Redstart, like most small passeriform birds, lays early in the morning on successive days.

Although Sutton (1928: 224) and Chapman (1917: 295) report occasional five-egg sets, none was observed during this study. In South Bass Island nests, the complement ranged from two to four; the average was 2.9.

#### ATTENTIVENESS OF THE FEMALE DURING INCUBATION

Incubation was performed exclusively by the female. Studies of the Black-throated Green Warbler by Pitelka (1940: 6), the Yellow-breasted Chat by Petrides (1938: 188), the Oven-bird by Hann (1937: 173), the Prothonotary Warbler by Walkinshaw (1938: 41), the Yellow Warbler by Schrantz (1943: 376), and the Redstart by Baker (1944: 86) all report a similar behavior.

According to the data obtained from two nests, there was but slight variation in the attentiveness of the female during the incubation period. Nest no. 3-40 was observed for a total of thirty-three hours during five days and nest no. 7-42 had a total observation time of sixty-three hours during a period of ten days. The data for the latter nest are much more complete and are cited more often.

On the second day after completion of the set, female no. 3-40 incubated 95 per cent of the time; this was the highest rate during her incubation period. The minimum for this bird was 84 per cent on the eleventh day, July 4.

Female no. 7-42 is known to have incubated during the laying



period. No records were made on June 21, the day the first egg was laid; however, on June 22, following the laying of the second egg, she incubated 39 per cent of the time during a five hour period. On the night of June 22, she stayed on the nest and continued to do so each night thereafter until the young were fledged. In studies of the Prothonotary Warbler (Walkinshaw, 1938: 41) and of the Oven-bird (Hann, 1937: 173) incubation began the day before the last egg was laid. It is not altogether clear, however, that these nests were watched closely earlier in the cycle, and there is a possibility that more detailed studies will reveal that this tendency of the Redstart to incubate earlier occurs also among other warblers. On June 23, the percentage of incubation time was 69.8 for five hours, with the attentive periods averaging 23 minutes. Following the laying of the fourth and last egg on June 24, the female incubated 93 per cent of the time during observations of six hours and twenty-five minutes, with attentive periods averaging 35 minutes. On the second day of incubation, June 25, she spent 90 per cent of her time on the nest as compared with 95 per cent for female no. 3-40 on the corresponding day. The Black-throated Green Warbler studied by Pitelka (1940: 6) incubated 81 per cent of the second day.

Incubation attentiveness shows no decisive trend during the cycle. To be sure, the peak of attentiveness as shown by both the daily percentage and average length of attentive periods was clearly reached early in the incubation cycle and if the data for July 2 are omitted there is a tendency for attentiveness to wane. The high values for July 2 were possibly caused by the relatively low temperature which prevailed. However, the fluctuation of attentiveness after the completion of the set until the day of hatching shows a fairly consistent relationship to temperature.

The attentiveness of the female ran in rhythmical periods during the time of incubation. The average for all of the morning periods was 25.5 minutes; for all afternoon periods, 23 minutes. The longest single period of attentiveness was 66 minutes during the morning of June 24, the day the last egg was laid, and the shortest was a three-minute period on the afternoon of the tenth day, July 3.

The average for all inattentive periods for the morning was 3.4 minutes; for all afternoon periods, 3.2 minutes. The longest periods of inattentiveness were 11-minute periods on the afternoon of June 29 and July 1. The shortest were one-minute periods of which there were several. It may be significant that the longest inattentive periods in the afternoons occurred on July 1, when the highest temperature was recorded. On the whole, the temperatures during incubation at this nest were not extreme.

Data concerning attentiveness and inattentiveness during incubation are summarized in Table 1.

As suggested by Nice (1937: 123) in her study of the Song Sparrow, the incubation rhythm seemed to be correlated with hunger, for the female usually fed immediately after leaving the nest. Her appetite and capacity were rather remarkable; for example, in the afternoon of June 29, in three minutes she caught and ate thirteen mayflies and one small dipterous fly. At another time she consumed five mayflies in one minute. There were a few instances when she did not feed

TABLE 1

INCUBATION ATTENTIVENESS AND INATTENTIVENESS AT NEST NO. 7-42

Date	Maximum attentiveness	Minimum attentiveness	Daily average attentiveness	Per cent of attentiveness	Maximum inattentiveness	Minimum inattentiveness	Average inattentiveness	Temperature range	Average temperature
6-22									
2nd egg	14	1	9.0	39	47	1	17.4	70-74	72.4
6-23									
3rd egg	41	11	23.0	69	52	2	8.3	62-68	64.0
6-24									
4th egg	66	19	35.0	93	3	1	2.2	60-75	68.5
6-25	52	16	23.5	90	7	1	5.8	65-70	66.7
6-27	46	16	28.0	93	3	1	1.6	66-70	68.4
6-29	45	4	21.9	83	11	1	3.6	70-80	76.5
7-1	32	4	19.5	78	11	1	4.8	71-84	77.6
7-2	38	12	26.0	88	5	1	2.5	60-71	66.3
7-3	44	3	21.9	82	10	1	3.8	66-80	72.3
7-4	35	4	15.9	77	7	1	4.0	67-78	72.7

immediately; on two different occasions she flew directly to the bath, and at another time a squirrel went too near and she slipped quietly off the nest and flew out of sight.

The female, contrary to Mousley's postulated general rule for warblers (1924: 288), left the nest in, and approached it from, every direction, changed her position on the nest often, and faced practically every direction; for example, in two hours and forty minutes, she changed her position thirty-eight times. During these changes she preened herself and turned the eggs. She was observed to turn the eggs a total of 460 times, at a rate of 8.4 times per hour. The maximum rate for this activity was 13.1 times per hour on the day after the last egg was laid. The rate gradually decreased to 6.4 times per hour on the day previous to hatching.

## BEHAVIOR OF THE MALE DURING THE INCUBATION PERIOD

During the incubation period, the male bird spent most of his time singing and protecting the territory. However, he seemed to be more attentive than studies of other warblers might suggest. At nest no. 7-42, on fifteen different occasions he fed the female at the nest, coming at least once a day and sometimes two and three times. On June 23, the female gave three low 'cheeps' immediately after returning to the nest. The male came to the nest, placed his bill in hers and held it there a moment, although no food was seen. Once on June 24 and again on June 25, when he fed the female, there was a moment's hesitation as the food passed from one bird to the other. On June 27, immediately after the female returned from feeding, she gave a few soft 'cheeps,' whereupon the male came with food which she accepted. This behavior is suggestive of courtship feeding (Lack, 1940: 169), which apparently is not definitely known to occur in the Redstart. More frequently, however, the female reacted to the male differently when he came to the nest with food. On twenty-six occasions she flew away at his approach. He did not remain long at the nest after she left, but ate the food and flew away. On July 1, he came to the nest six times and on July 3, just before the hatching of the first egg, he came four times. The male at nest no. 3-40 also was observed to feed the female at the nest during incubation. This behavior contrasts strongly with that of the male Black-throated Green Warblers observed by the Nices (1932: 166) and Pitelka (1940: 6).

## LENGTH OF INCUBATION PERIOD

The length of incubation was not determined with any degree of exactness. At none of the successful nests were the eggs marked, yet records on three nests give an approximation. At each of these three, it was known to be close to eleven days. The record for no. 7-42, which is the most complete, is as follows:

<i>Time of egg laying</i>	<i>Time of hatching</i>
June 21 —————	July 3—1:42 P. M.
June 22—5:00 A. M.	July 3 to July 4 at 7:06 A. M.
June 23—5:12 A. M.	July 4—8:10 A. M.
June 24—5:03 A. M.	July 4 to July 5 at 5:00 A. M.

Assuming that the eggs hatched in the order in which they were laid, then the intervals between laying and hatching were twelve or more days for the first, eleven or more for the second, eleven days three hours for the third, and between ten days eleven hours and eleven days for the fourth. Since the fourth egg was laid at 5:03 A. M., June

24, and since all eggs had hatched by 5:00 A. M. July 5, it may be concluded that the minimum period required for development was no more than eleven days. Sears (*in* Chapman, 1907: 292) reported a 12-day incubation period.

The incubation periods of eleven days for the Yellow Warbler (Schrantz, 1943: 376) and of twelve days for the Black-throated Green Warbler (Pitelka, 1940: 6) compare closely. In the Oven-bird the period varies (Hann, 1937: 174) from eleven days twelve hours to fourteen days, with an average of twelve days. In his study of the Prothonotary Warbler, Walkinshaw (1941: 11) found in Tennessee an average incubation period of twelve days, ten hours; and in Michigan an average of twelve days and seventeen hours.

#### CARE OF THE YOUNG

The first egg hatched July 3, and the shell was eaten by the female. The part of the shell too large to be swallowed was broken into smaller pieces by a chewing action of the beak similar to that reported by Nice (1937: 96) in her study of the Black-throated Green Warbler and by Hann (1937: 174) in the study of the Oven-bird.

Approximately forty minutes after the first egg hatched, the male brought food and presented it to the female. She worked the food in her beak and offered it to the young but did not succeed in feeding them. During the remainder of the afternoon the male brought food five different times but succeeded in feeding the young only once. Each time he came the female left; and he stood on the edge of the nest, gave several low 'cheeps,' manipulated the food in his bill, and offered it to the young. When either adult approached the nest it gave several 'cheeps,' and the attending bird usually left the nest immediately, although in some instances it waited until the other arrived.

Following the hatching of the last egg, the male and female cooperated in feeding the young and cleaning the nest. The male Redstarts played an important rôle in the care of the young at all of the nests observed in this study. As was noted by Baker (1944: 86), only the females brooded. This seems to be the general rule among warblers. However, Mousley (1924: 267) records an instance of brooding by a male Parula Warbler.

At nest no. 3-40, data concerning parental care were obtained during three days; and at nest no. 7-42, during eight days. Data concerning brooding are summarized in Table 2. At nest no. 7-42, from the second to the sixth days there was a gradual decrease in the average length of brooding periods and in the percentage of brooding time.

TABLE 2  
ATTENTIVENESS DURING NESTLING PERIOD AT NESTS NO. 3-40 AND NO. 7-42

Dates	Number of days after hatching	Number of periods of brooding	Extremes of duration in minutes	Average duration in minutes	Total number of minutes	Per cent of total time	Average temperature	Number of periods of brooding	Extremes of duration in minutes	Average duration in minutes	Total number of minutes	Percent of total time	Average temperature	Per cent for day	Daily average temperature
7-6-40.	2	6	8-24	16.5	99	86.0	74.2	12	2-20	10.0	121	65.4	76.8	73.3	75.0
7-9-40	5	14	1-9	5.0	61	45.6	80.3	12	1-16	7.8	94	49.5	71.6	47.8	75.4
7-11-40	7	19	1-14	6.3	120	47.6	70.4	16	1-15	4.2	68	27.3	74.6	37.3	72.5
<b>Morning</b>															
7-5-42	1	10	3-16	9.4	94	73.4	69.8	6	4-20	14.8	89	83.7	81.8	77.9	75.8
7-6-42	2	11	5-24	11.4	126	80.9	61.8	19	3-20	9.9	188	79.7	66.3	80.9	64.0
7-7-42	3	13	2-15	8.5	111	79.3	65.6	21	1-19	7.0	148	68.2	72.6	72.6	69.1
7-8-42	4	26	1-25	7.6	197	72.7	69.6	33	1-15	6.2	205	50.7	74.6	59.6	72.1
7-9-42	5	16	2-14	6.3	102	59.3	67.0	16	1-17	5.9	95	56.9	66.5	58.1	66.7
-10-42	6	22	1-16	4.3	98	38.1	68.0	26	1-19	5.4	140	36.2	70.8	37.0	69.4



The average length of brooding period for the total observation time at this nest was 7.2 minutes as compared to an average of 9.1 minutes found by Baker (1944: 86) and 9.5 minutes found by Mousley (1924: 287). The percentage of brooding from the second to the sixth day, at which time this activity ceased, decreased from 80.9 to 37 during daylight, but the female apparently continued to brood during the night as long as the nestlings remained in the nest. Comparable decrease in brooding was noted in the Black-throated Green Warbler by both Nice (1932: 103) and Pitelka (1940: 11). Mousley (1924: 286) states that female warblers in general do more brooding than feeding in the early stages.

At the nest watched by Mousley (1924: 234), the female fed the young more often than the male. In this study the reverse was true, the male did more feeding than the female, although the female also fed actively between periods of brooding. For example, on the sixth day, during a period of eleven hours and ten minutes, the male fed eleven times per hour and disposed of thirty faecal sacs. In the same period, in addition to brooding 37 per cent of the time, the female fed seven times per hour and disposed of twenty-six sacs.

The average number of feedings per hour gradually increased each day from 4.4 for the male and 2 for the female on the first day, to 18 for the male and 10 for the female on the eighth day. On the seventh day, the first day on which there was no brooding, the male fed one and one-half times as often as the female and on the eighth day almost one and three-fourths times as often. The combined feedings by both birds during the first day averaged 5.8 times per hour, or one feeding every 10.3 minutes. On the seventh day the rate was 18.8 per hour or one every 3.1 minutes; and on the eighth day, 28 per hour or one every two minutes.

During the entire nestling period the rate of feeding for the male was 7.6 times per hour, or about once every 8 minutes; and for the female 4.4 times per hour or once every 13.5 minutes. Together they fed the young an average of once every 5 minutes or 12 times per hour. This is a much more rapid rate of feeding than was reported by Mousley (1924: 287) and by Baker (1944: 88), and probably a more truly representative one since it is based on a longer period of observation (52 hours during eight days). The nest observed by Mousley also contained four young; Baker's nest apparently contained only two.

In contrast to other warblers as reported, the male fed more often and also fed larger quantities and to more young at a feeding (Nice, 1930: 343; Pitelka, 1940: 8-9; Baker, 1944: 89). He usually fed a moderate-sized green caterpillar, three or four spiders, or one or two

mayflies. The female usually fed smaller insects or spiders. The male often fed two young at a feeding and on fifteen occasions fed three. The female on six occasions fed two young at one time but at no time did she feed three.

The faecal sacs were disposed of by both the male and the female. During the first three days of the nestling period both birds ate the sacs, which usually were discharged immediately after feeding. As with the birds observed by Baker (1944: 88), they began carrying the sacs away on the fourth day, and carried away thirteen out of fifty-two during eleven hours and forty minutes. Both the male and female carried the sacs to a near-by limb, dropped them to the ground, and then wiped their beaks on the limb. They stopped eating sacs altogether after the sixth day. This behavior varied slightly from that at nest no. 3-40 where both birds ate a few sacs as late as the ninth day, although the majority were carried away. At nest no. 7-42, the average for the fourth day was 4.4 disposals per hour; for the sixth, 5.4 per hour; and for the eighth, 3.5 per hour. The fact that the sacs were larger and that observations were limited may have contributed to the apparent reduction on the eighth day.

The last observations at this nest were made on the eighth day after hatching. An attempt was made to band the young birds, and when the limb was touched the nestlings left in every direction. Only three of the young were found and banded. The female reacted in an interesting manner. She 'cheeped,' fanned her tail, and ran along the ground fluttering both wings, at times coming so near that she touched the observer's clothing.

The male did not become as excited as the female and, after the first few minutes, sat above, among the branches, scolding. He resumed feeding the young almost immediately after they were released, but the female continued to display and scold for several minutes before she began to feed. Thirty minutes later the male was feeding one of the young that was sitting on a wire about twenty feet from the nest tree, and the female was feeding two young that were on the ground 40 to 50 feet away from the same tree. Three days later the male was observed feeding a young bird in a near-by maple and the female was flitting among the topmost branches of another tall tree catching insects.

#### LENGTH OF NESTLING PERIOD

Since the young left somewhat prematurely at nest no. 7-42, this record does not offer a good basis for determining the normal length of the nestling period. Two other nests, nos. 3-40 and 4-42, afford better data. The last egg of no. 3-40 was hatched on July 5 and the

last young left the nest on July 14, which made the length of this nestling period nine days. At nest no. 4-42 the last egg hatched on June 24 at 11:55 A. M. and the young left on July 3, before 7:00 A. M. This would make a minimum nestling period for the youngest bird of about eight days and nineteen hours. The above figures would indicate that the nestlings of no. 7-42 left the nest about one day earlier than normal. In the studies made by Mousley (1924: 285) and Baker (1944: 87), the young left the nest at the age of eight days, but both nests were disturbed.

The nestling period given by Hann (1937: 178) for the Oven-bird was about eight days. Pitelka (1940: 13) found the nestling period for the Black-throated Green Warbler to be between eight and ten days; and the Nices (1932: 171) found it to be between eight and nine days, in one case, and eight days in another case for the same species. Schrantz (1943: 384) found that the Yellow Warbler left the nest in nine and one-half days. In the Prothonotary Warbler, which nests in cavities, the period is distinctly longer—ten and three-fourths to eleven days (Walkinshaw, 1941: 11).

#### COWBIRD PARASITISM

Cowbird parasitism of the Redstart nests observed on South Bass Island has been very infrequent in contrast to most observations made elsewhere. At Ithaca, New York, Friedmann (1929: 196, 252, 303) found that the Redstart was one of the five species most frequently parasitized, with twenty-three of thirty-four nests containing Cowbird eggs. Hicks (1934: 336) found Cowbird eggs in seven of twenty-two Ohio nests, but Sutton (1928: 224) found no parasitism in the Pymatuning Swamp area of Pennsylvania. Of the eighteen nests observed in the present study, only one was parasitized. This contained two Cowbird eggs when discovered and the nest had been deserted. One other presumptive instance of parasitism in this species was noted when a male Redstart was seen feeding a young Cowbird.

Reactions of the Redstart toward the Cowbird were noted several times. For example, during the building of nest no. 3-40, when a female Cowbird appeared on the scene, the male Redstart flew at her with his tail spread and his head lowered. He snapped his beak loudly as he flew but the Cowbird did not move. The male gave up the chase after two or three attempts and flew away. The female left at the beginning of the disturbance and did not return to the nest for twenty minutes. In the meantime, the Cowbird had gone. It was the aggressive action of another female Redstart toward a female Cowbird that led to the discovery of nest no. 4-40. During the fourth day of

incubation at nest no. 7-42, a female Cowbird came to the fence near the nest tree and was attacked simultaneously by a male Redstart and a male Indigo Bunting. At the call of a Cowbird the incubating female sank as low in her nest as possible and sat quietly for several minutes. She reacted in a similar fashion to the presence of grackles.

#### NEST SUCCESS

Of the various factors which adversely influenced nesting success, the most conspicuous was unfavorable weather. Storms destroyed two nests and seemed to be responsible for the desertion of others. One nest was robbed by a small fox snake (*Elaphe vulpina gloydi*) which had swallowed all three eggs when discovered coiled in the nest. Four nests were deserted because of some unknown factor. One of these contained four slightly incubated eggs and another contained only two Cowbird eggs.

In eighteen nests which were observed during the years, 1940 and 1942, a total of fifty eggs was laid. Out of this total there were twenty-eight (56 per cent) eggs hatched, or an average of 1.5 per nest; twenty-six (52 per cent) birds fledged, or an average of 1.4 fledglings per nest. There were eleven successful nests (nests from which at least one young was fledged) and of these, seven were completely successful.

The only other warblers for which there are comparable data are the Yellow Warbler (Schrantz, 1943: 385) in which there was 54 per cent success, the Oven-bird (a ground-nesting species), and the Prothonotary Warbler, which nests in cavities. These differences in the nesting habits of the two last named seem to have considerable bearing on the nesting success. In the Oven-bird, heavy losses in both eggs and young resulted in a low degree of nesting success (Hann, 1937: 198). In the Michigan Prothonotary Warbler (Walkinshaw, 1941: 15), losses were even more severe, both in eggs and young, but in the Tennessee Prothonotary there were moderate losses among the eggs and no losses among nestlings, resulting in a much higher rate of nesting success. The situation in these Redstarts agrees more closely with that of the Prothonotary Warbler than with that of the Oven-bird in that losses occurred principally before hatching. The degree of nesting success (52 per cent), although below that of the Tennessee Prothonotary Warblers, was well above the general average (43 per cent) for small passeriform birds nesting in the open as reported by Nice (1937: 143). Studies throughout the season at South Bass Island might show altered figures relative to success, since many early nests were apparently unsuccessful.

A noteworthy point in connection with the breeding population



was the relative proportion of yellow-plumaged males. In thirty-two pairs with nests, during the three years, twenty-nine of the males were red-plumaged and only three wore the yellow and gray plumage that is supposedly characteristic of first-year males. Two additional yellow males held territories but did not secure mates. If the sequence of plumages as outlined by Dwight (1900: 288) is followed by all individuals, males invariably retaining the yellow and gray plumage into the first breeding season, then less than one tenth of the South Bass Island breeding males were first-year birds. This figure compares closely to the proportion in a population of Redstarts in New York studied by Hickey (1940), who reported that of forty-eight males on territory "only four were in the immature plumage."

#### SUMMARY

In a study of the nest life of the Redstart at South Bass Island, Ottawa County, Ohio, it was found that:

1. The Redstarts exhibited strongly territorial behavior early in the nesting cycle but defended their territories infrequently after the young hatched.
2. Females as well as males defended territory; one female attacked intruding Redstarts of both sexes.
3. Territories were quite small. On an area of 1.4 acres, there were nine territories in 1941 and six in 1942, yielding averages of 0.16 and 0.23 acres for the two years.
4. At one nest, the territorial boundary was not permanent. Some space was added during nest building and some lost during incubation.
5. Nest building was performed exclusively by the female and required between two and one-half and three days.
6. During nesting, the males sang actively and defended their territories.
7. At one nest, egg laying began on the day following the completion of the nest; at a second nest, after a lapse of one day.
8. The eggs were laid early in the morning on successive days.
9. Incubation was performed exclusively by the females. At one nest, incubation began at a low level on the day that the second egg was laid, attained its full level on the day that the fourth egg was laid, and subsequently fluctuated within rather narrow limits.
10. At one nest, the average length of attentive periods during incubation was 22.8 minutes and the length of inattentive periods averaged about three minutes in duration.
11. The average rate of egg turning per hour during incubation at one nest was 8.4; the greatest rate for this activity was 13.1 on the day



following the laying of the last egg; the rate of this activity decreased on later days of incubation.

12. During incubation at two nests, the male Redstart frequently came to the nest with food.

13. Brooding was performed exclusively by the females. At one nest, the female did not brood during the daytime after the sixth day but continued to brood at night; at another nest the female brooded on the seventh day after hatching.

14. At two nests, the males fed the young more often than the females and fed larger quantities.

15. The rate of feeding gradually increased from 6.4 times per hour, on the first day after hatching, to 29.3 on the eighth day, averaging 12 feedings per hour for the entire period.

16. At one nest, both the male and female ate all the faecal sacs until the fourth day. From the fourth to the sixth days, some were eaten and some were carried away. On the seventh and eighth days all were carried away. At another nest some sacs were eaten as late as the ninth day.

17. At two nests, the nestling period was between eight and nine days.

18. Parasitism by the Cowbird was infrequent; only one nest in eighteen contained Cowbird eggs. Both male and female Redstarts reacted aggressively toward female Cowbirds.

19. In most features, the division of labor between male and female Redstarts during the nesting cycle resembled that in other warblers.

20. Nesting success was higher among these Redstarts than is usual among small passeriform birds which use open nests. Losses were much heavier among eggs than among young.

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*Glendale*  
*Ohio*

## TEMPERATURE AND GROWTH STUDIES OF THE NORTHERN CLIFF SWALLOW

BY DAYTON STONER

THIS study of the Northern Cliff Swallow, *Petrochelidon pyrrhonota albifrons* (Rafinesque), is one of a series of investigations which the writer has conducted on the Barn Swallow (The Auk, 52: 400-407, 1935), the Bank Swallow (Roosevelt Wildlife Annals, 4: 122-233, 1936) and the Eastern Phoebe (New York State Museum Circular, 22: 1-42, 1939) in an attempt to compare certain features of the life history, body temperature and growth rate of the young. It is believed that such a comparison will furnish some interesting and worthwhile contributions to our knowledge of the biology of these birds as well as provide a better understanding of the taxonomic relationships and differences exhibited by them. For comparative purposes, temperature and measurement data on a few adult individuals also are introduced. The method of presentation of results is similar to that employed for the Barn Swallow in a past number of this journal (*loc. cit.*).

Preliminary observations on the weight and temperature of Northern Cliff Swallows were initiated in the Oneida Lake (New York) region in 1931. However, the major part of the studies here reported upon have been confined chiefly to three Cliff Swallow colonies all within a radius of twenty miles of Albany, beginning about June 1 and continuing through July and early August of the seasons 1934 to 1938, inclusive. The largest colony comprised 66 domiciles. Regular visits were paid to these nesting colonies thrice weekly. Thus our records were obtained on alternate days save for one two-day interval each week. Mrs. Stoner assisted in collecting the data.

On the occasion of our first seasonal visit to each colony, the domiciles were counted and numbered and the number of eggs in each nest was recorded. At subsequent visits, newly constructed domiciles, if any, were marked and the condition of affairs in those previously examined was ascertained. Owing to the fact that the eggs in some nests hatched between visits it was necessary to *estimate* the age of these small birds in hours. Previous experience with hundreds of young Bank and Barn Swallows provided satisfactory criteria on this point.

With the hatching of a brood, temperature, weight and growth records for each nestling were begun and continued to the time it left the parental domicile. Included in these were seven different measurements of body structures and ten of feathers. The young were first marked with colored threads tied about the tarsus. Later,

the numbered metal bands furnished by the U. S. Fish and Wildlife Service were substituted for the threads.

Within a few minutes after our arrival at a nesting colony the domiciles and their contents had been examined while the temperatures of the young birds were taken immediately upon their removal from the nest. Previously prepared equipment and record blanks facilitated this procedure and permitted procurement of the data with a minimum of disturbance to the activities of the colony, some of which might be reflected in our findings. As rapidly as the birds' temperatures were obtained, the nestlings were transferred to a box divided into small, numbered, cotton-lined compartments there to await further observations.

Temperature readings were taken with an extremely sensitive, specially designed, non-self-registering mercury thermometer graduated to two-tenth-degree divisions in the Fahrenheit scale. The instrument was quickly inserted down the throat, well into the gullet of the subject, whereupon the reading was almost immediately indicated.

Weight readings were obtained with a triple-beam balance sensitive to one-tenth gram. After the birds had attained some size, a small metal box was used to confine them on the scale platform. Measurements were made with dividers on a steel rule graduated in one-half-millimeter divisions.

In all measurements involving feathers, the "length" here means the distance between the tip of the feather and the point at which the shaft emerges from the skin. The "distance beyond sheath" is the distance between the feather tip and the distal end of the enveloping sheath. In the humeral, ulnar and certain other bony measurements, the skin and at least a small amount of other tissue of course intervened between the parts and the divider points. On this account the measurements cited are slightly in excess of the actual measurements of the bones themselves.

Incorporated in this report are the records from 83 young Northern Cliff Swallows, the inhabitants of 35 different nests. In the field, the records were kept separate for the individuals occupying each nest. Later on these birds were grouped according to age in days and without regard for family relationship. On this basis the information relating to temperatures, weights and measurements was tabulated. In some cases the hatching time of a clutch of eggs extended over a period of more than 24 hours. This necessitated the placing of the nestlings into two age groups, one or more falling in the 1- to 24-hour group, the others falling in the 24- to 48-hour group. Indeed, in a few

instances, more than 48 hours were required in which to complete the hatching of a single egg-clutch. From this grouping resulted a composite series of data based on the age—either estimated or known to within a few hours or less—of the 83 nestlings.

Complete or nearly complete records were obtained on about 60 per cent of the young on which we began taking records; approximately 20 per cent provided but a single series of records while a similar proportion provided from two to seven. A series of eight or nine sets of readings on a single family of young was the maximum number that we could expect to obtain in relation to the intervals elapsing between observations.

Since the same number of individuals was not always available for all the measurements indicated in the accompanying graph, the number of individuals concerned in the compilation of the various structures represented by the curves is omitted. In most cases of key measurements for certain age groups, the number of individuals concerned is indicated in the text.

*Weight.*—At the time of hatching or within two to six hours thereafter, the weights of young Northern Cliff Swallows varied from 1.6 to 2.2 grams. For 18 individuals varying in age from one to 24 hours, the average weight was 2.6 grams with a minimum of 1.6 grams and a maximum of 3.6 grams.

By way of comparison, it may be noted that the average weight of 52 eggs from 15 clutches was 1.97 grams with a minimum of 1.4 grams and a maximum of 2.4 grams, one egg for each extreme. Thirty-two of the eggs fell in the 2.0- to 2.4-gram group, 18 in the 1.6- to 1.9-gram group.

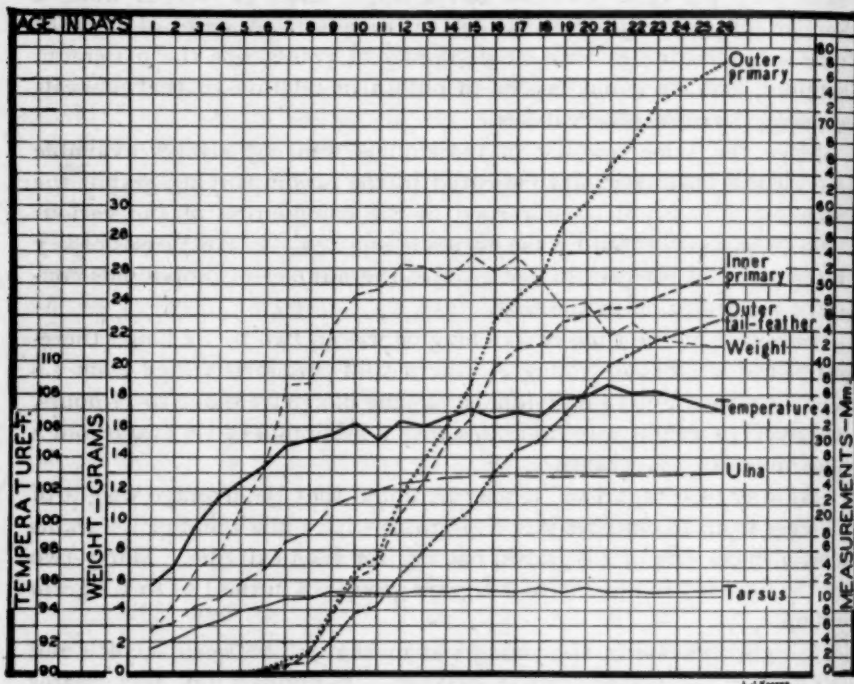
Weight increase in the young was most rapid between the 4th and 10th days; the average rate of increase, 2.36 grams a day, was greater than for any other like period of time. For seven birds ten days old, the average weight was 24.3 grams; maximum weight, average about 26.3 grams, was attained on the 12th day. This average held until the 17th day, then gradually diminished until, at the time of leaving the nest—23 to 26 days—the birds averaged about 21.5 grams.

Among the nestlings studied, only five individuals attained a weight of as much as 30 grams. The heaviest bird weighed 2.2 grams at age 6 to 8 hours, 30.2 grams at age 12 days, 32.8 grams at 14 days and 33.2 grams at 17 days. However, at age 21 days the weight of this individual had dropped to 21.0 grams, truly a remarkable decrease for a nestling that appeared to be in a normal and healthy condition.

The average weight of three incubating or brooding adults was 23.83 grams; maximum 25.6, minimum 21.1 grams.



*Temperature.*—The difficulty of obtaining accurate temperature records of birds by means of even a very sensitive mercury thermometer and of properly appraising the findings are well apparent to the writer. However, the results obtained in this investigation closely approximate those reported upon by the writer for allied species of this family and compare favorably with the results of



TEXT-FIGURE 1.—Mean daily rate of increase in temperature, weight and growth of 83 young Northern Cliff Swallows from hatching to the time that flight ability was attained. Albany, N. Y., seasons of 1934-1938, inclusive.

workers who have used more refined methods with other species of birds. So, it is believed that our records represent with reasonable fidelity the actual conditions.

For nine young Cliff Swallows varying in age from one to 24 hours and brooded by the adult immediately before the readings were taken, the average temperature was  $95.55^{\circ}$  F.; minimum reading  $88.4^{\circ}$  degrees, maximum  $100.0^{\circ}$  degrees. As in the case of the Barn Swallow, increase in temperature was most rapid during the first ten days of nest life, with the greatest rise occurring in the first five-day period.

The average for eleven five-day-old birds was 102.45 degrees; for the same number of 10-day-old nestlings it was 106.14 degrees. At age 20 days, the average for 19 nestlings was 107.87 degrees. Average temperatures for nestlings increased slightly to age 23 days, but for two young 26 days old the average was only 107.10 degrees while for two adults it was 109.5 degrees. Undoubtedly this discrepancy in results was due in part to circumstances incident to the capture of these temperamental birds as well as, in part, to the instability of the temperature-control mechanism and the consequent extraordinary rapidity with which this condition is registered with the instrument and technique employed.

Attempt was made to obtain the comparative growth rate of the bony endoskeleton through measurements of the tarsus, ulna and humerus.

*Tarsus.*—At the time of hatching, the average tarsal length is 3.0 mm. For 18 nestlings varying in age from six to 24 hours, the average tarsal length was 3.19 mm. Average tarsal length for twelve 5-day-old birds was 7.91 mm. with a minimum of 7.0 mm. and a maximum of 9.0 mm. Near-maximum length, 11.0 mm., was attained at age 12 to 13 days with highest growth rate occurring during the first six days of nest life. Our figures indicate that tarsal growth rate in the Cliff Swallow slightly exceeds that in the Barn Swallow.

Average tarsal length for three adults was 11.0 mm. with a minimum of 10.0 mm. and a maximum of 12.5 mm.

*Ulna.*—For four nestlings varying in age from six to eight hours, the average ulnar length was 5.1 mm. Rate of increase in length was greatest during the first ten days of nest life, averaging about 1.76 mm. a day. However, a small but steady amount of growth continued for the succeeding seven or eight days. Average ulnar length for 14 nestlings in the 18-day-old age group was 25.78 mm. Some fluctuations in the average length also occurred after the 18th day with an exhibited tendency toward further slight increase in length.

The average ulnar length for three adult individuals was 26.16 mm.

*Humerus.*—For the four 6- to 8-hour nestlings mentioned above in the discussion on ulnar growth, the average humeral length was 4.5 mm. During the first five days these two bones grew at approximately the same rate although, even at this early stage, the ulnar growth rate slightly exceeded the rate for the humerus. However, during the 6th to 12th days the growth rate of the ulna increased to slightly more than double that of the humerus. As in the case of the ulna, increase in humeral length was greatest during the first ten days of post-natal life averaging about 1.03 mm. a day. At age 18 days, the average

humeral length for 14 nestlings was 16.85 mm. Thereafter, the composite age-groups exhibited a little fluctuation for humeral length with a slight tendency to increase in length of the member.

Average humeral length for three adults was 17.50 mm.

*Outer primary.*—One of the chief differences between the Barn Swallow and the Northern Cliff Swallow is the comparatively retarded growth rate of the principal flight feathers in the latter species. Undoubtedly this is correlated in part with its protracted period of nestling life which averages two to five days longer than that of the Barn Swallow.

In most nestling Cliff Swallows, the outer primary becomes evident as a minute rounded point on the fourth day and in a few instances even as early as the third day. For 12 nestlings five days old, the average length of this feather was only 0.13 mm., more than 1.25 mm. less than for young Barn Swallows of this age. And, for seven 10-day-old Cliff Swallows the average length of the outer primary was only 9.08 mm. as compared with 21.66 for the Barn Swallow. For 17 Cliff Swallows at age 15 days, average outer primary length was 37.29 mm. (46.11 mm. for the Barn Swallow); at age 18 days, 14 Cliff Swallows exhibited an average length of 51.07 mm. for the outer primary (56.0 mm. in the Barn Swallow) and at age 20 days, the average length of the outer primary in 19 Cliff Swallows was 60.63 mm. (67.6 mm. in the Barn Swallow). At the time of first flight—20 to 21 days—the outer primary averages 60 to 65 mm. in length. For seven 23-day-old Cliff Swallows the outer primary averaged 73.06 mm. in length while at 26 days the average length of this feather for three individuals was 78.16 mm.

For three adult Cliff Swallows, the average length of the outer primary was 86.0 mm., maximum 93.0 mm., minimum 81.0 mm. (Barn Swallow 114.5 mm.).

As in the Barn Swallow, the daily growth rate of the outer primary in the Cliff Swallow varied somewhat among nestlings; but neither among the members of a given brood nor in our age groupings, irrespective of family relationships, did the discrepancy in length of the feather often exceed 10 mm. From the time of first measurable appearance of this flight feather—in most individuals on the 4th day of nest life, to age 21 days, the average age at first flight—the daily growth rate of this feather averaged 3.6 mm., approximately 0.4 millimeter less per diem than in the Barn Swallow. During the 10th to 15th days, the average daily growth rate of this feather amounted to 4.81 mm., a rate almost as high as in the Barn Swallow. For the nestlings falling in the 15- to 20-day age group the growth rate decelerated somewhat, averaging for the period 4.26 mm. per diem.

It will be noted, therefore, that at the time of initial flight, the outer primaries of both the Barn and Cliff Swallows are about the same length but that in the latter species three more days have been required to permit the ability of protracted flight. Furthermore, in the Barn Swallow, at first flight, the outer primary has attained only about one-half its adult length while in young Cliff Swallows with this ability it has acquired approximately three-fourths of its adult length. This may be associated with the heavier body, actually shorter primary feathers, more rounded wing and consequent less buoyant flight of the latter.

As in the Barn Swallow, the vane of the outer primary in the Cliff Swallow seldom breaks through the sheath before the 9th day. And, as in that swallow, the length of the feather beyond the sheath varied considerably among the members of a given age group as well as among the members of a family; indeed, a difference of several millimeters often prevails in the exposed portion of like feathers of opposite wings of some nestlings. A similar circumstance frequently prevailed in the other flight feathers measured. Undoubtedly, the rate at which the vane is released from the sheath is dependent to a considerable degree upon the extent of nest activities and exercises. The average length of vane beyond the sheath was 2.71 mm., in 10-day birds (5.11 mm. in Barn Swallow); 18.47 mm. in 15-day birds (29.94 mm. in Barn Swallow), 30.60 mm. in 17-day nestlings (41.86 mm. in Barn Swallow) and 45.13 mm. in 20-day Cliff Swallows (54.0 mm. in Barn Swallow).

*Inner primary.*—Although this feather appeared externally as early as the outer primary, it did not attain the length of that feather nor grow as rapidly. Until the 15th day of nest life, the growth rates of these two feathers were practically the same. But from the 15th day, deceleration in growth of the inner primary occurred and the disparity in length between the two feathers gradually became more obvious. For the 15- to 20-day age period, the average growth rate of this feather was 2.6 mm. per diem (4.26 mm. for outer primary).

As in the Barn Swallow, both inner and outer primaries in most nestlings began to emerge from the feather sheaths on the 9th day. And, although the rate of emergence of the vanes of these feathers varied considerably in different individuals, in the Cliff Swallow it was consistently lower than in the Barn Swallow.

*Other wing feathers.*—It is interesting to note that the coverts of both outer and inner primaries appear externally at about the same time—the 8th day. However, between the 8th and 28th days, the inner primary covert increased at an average daily rate of 1.60 mm.



(length 24.08 mm.) while average daily growth rate of the outer primary covert for this period was only 1.02 mm. (length 15.33 mm.). In other words, the covert of the more rapidly growing outer primary increased in length at a considerably slower rate than did the covert of the much shorter and less rapidly growing inner primary.

*Outer tail feathers.*—In a few nestlings the outer tail feathers appeared as early as the second or third day, but in only one bird were they as much as 1 mm. in length at six days. Indeed, the average length of this feather for 16 7-day-old birds was only 1.05 mm. For seven 10-day birds the outer tail feather averaged 7.57 mm. (Barn Swallow 13.69); for 17 nestlings 15 days old, the average length of the outer tail feather was 21.20 mm. (Barn Swallow 31.41) while for 18 birds at 20 days it averaged 36.30 mm., 12 mm. less than in Barn Swallows of the same age group. During the following six days the average growth rate of this feather declined to about 1.5 mm. per diem, the length at age 26 days being 45.66 mm.

For three adult individuals captured in their domiciles the average length of the outer tail feather was 50.83 mm.

*Middle tail feathers.*—This pair of feathers appears at the same time as the outer tail feathers—2nd to 3rd day of nest life—but, from the beginning the growth rate is *slightly* though consistently less than for the outer tail feathers. At age seven days, the average length of the middle tail feather was 0.58 mm. During subsequent nestling life the maximum discrepancy in length between outer and middle tail feathers averaged just a little more than 1 mm. in the several age groups. Of course this discrepancy gradually became more pronounced in the Barn Swallow. In 10-day Cliff Swallows the average length of the middle tail feather was 6.14 mm. (Barn Swallow 11.69); in 15-day birds 20.97 mm. (Barn Swallow 27.52), and for 18 20-day individuals 35.27 mm. (Barn Swallow 39.30). At age 26 days, the average length of the middle tail feather for three birds was 44.16 mm.

The average length of the middle tail feather for three adult Cliff Swallows was 44.33 mm.

#### SUMMARY AND CONCLUSIONS

This report considers weight, temperature and growth data obtained near Albany, New York, from 83 nestling and three adult Northern Cliff Swallows. The results of the study are compared with those obtained in a similar investigation on the Barn Swallow which were published in this journal (52: 399-406, 1935).

The Northern Cliff Swallow is characterized by a more nervous and unstable temperament than its phlegmatic relative, the Barn Swallow.



This instability of temperament is illustrated in the irregular occurrence and disappearance of the species in a given locality and probably accounts for the frequent reports of its local reduction in numbers or its absence from certain sections. It is further indicated by the Cliff Swallow's ready response to immediately disturbing factors which interrupt the ordinary routine associated with incubation of the eggs as well as brooding and care of the young. Hasty and irregular feedings frequently result in considerable disparity in size and irregularity in the growth of the nestlings of a family. Such irregularities are particularly evident among nestlings in the lower age groups. However, these discrepancies in size and feather growth among the members of a family early in life tend to disappear later on as the rapidly growing feathers conserve bodily heat and render metabolic activities more uniform.

In general, the average increase in temperature, weight and growth of most structures indicated on any given day for most of the age groups is "normal" and about what the experienced investigator might expect to find. However, it sometimes happens that one or more of the average measurements for such an age group may be a little *below* or *above* the normal while most of the measurements are in line with those for both the immediately preceding and immediately succeeding days. Usually this discrepancy levels out in the immediately succeeding age group.

For example, in the records presented for 12-day-old birds, the average measurements for humerus and hind toe with claw as well as width of bill at gape are apparently a little less than they should be while tarsal length and width of bill at nostril are fractionally greater than one might expect. On the other hand, the average length for all the feathers measured is somewhat in excess of expectations.

I believe that while this situation may be due in part to the human failure in obtaining refined accuracy of the measurements and to lack of adequate records, it also is a reflection of the unstable temperament of the Cliff Swallow.

In young Cliff Swallows the most rapid increase in body temperature extends over the first seven to eight days of nest life (five to six days in the Barn Swallow). During the succeeding five to six days, bulk—as indicated by weight and size—continues at or near its earlier rate of increase. Near-adult measurements and weight are acquired at the 12th to 13th days of nestling life (9th to 10th days in the Barn Swallow).

This study serves to illustrate the fact that feathers of a lower order of specialization and position attain full growth earlier than those

feathers which are more highly specialized from the standpoint of position and adaptability with relation to flight. However, the growth rate of these specialized feathers is considerably accelerated as compared with the general body feathers; that is, they attain a proportionately greater length in a relatively shorter space of time than do the body feathers.

Growth of the principal flight feathers is most marked in the Cliff Swallow after the sixth day (fourth day in the Barn Swallow) of nest life. This accelerated rate of feather growth continues well through the 21st day.

From about the 21st day until near-maximum primary growth is attained, five or six days later, the feather sheath breaks away at approximately the same rate as the feather grows; during this latter period, however, an evident deceleration occurs in the growth rate of these feathers.

Bony growth as indicated by measurements of ulna, humerus and tarsus is most rapid during the first ten to eleven days of nestling life when near-adult size of these structures has been attained. Thus 24 to 48 hours more are required by the Cliff Swallow to reach this condition than were recorded for the Barn Swallow.

The most notable imbalance between feather growth and bony growth and among feathers themselves occurs between the 11th and 14th days (see feather growth 11th day *vs.* 12th day). These instabilities appear to be concomitant with the establishment of temperature control.

The nesting sites of the Northern Cliff Swallows mentioned in this report were visited by us thrice weekly during a large part of the summer. During each visit the temperature, weight and 17 different measurements of each of several nestlings was obtained. Despite these disturbances of the birds' activities, little permanent interruption of routine procedures was apparent. Occasionally, in removing the young birds from the domiciles, the openings thereto were broken. But upon our departure from the scene the adults usually began immediately to repair the damage so that long before the time of our next visit the necessary reconstruction had been effected.

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## INBREEDING AMONG PEN-REARED QUAIL

BY RALPH B. NESTLER AND ARNOLD L. NELSON

THE effect of inbreeding in wildlife species has received attention from several sources. Recently the 'inbreeding theory' as a possible explanation of cycles in game populations was given careful consideration by a group of wildlife experts and geneticists. Scott's symposium (1944) consisting of comments received from eight authorities revealed unanimity in a decision that inbreeding is not the causative factor. A few quotations from this illuminating article are in order:

"It is not difficult to cite a few examples which show quite clearly that inbreeding when it does occur among wild animals is not necessarily harmful."—SWANSON.

"It is apparent that nature has devised a good system for dispersion of populations under normal circumstances."—SWANSON.

"Cycles are due to factors in no way related to inbreeding."—STEEN.

"Inbreeding, in the sense probably intended by the supporters of this theory, is not, and never was supported by evidence. Some of the most stable populations in existence are the most inbred.—Any analogy with poultry and domestic animals is not valid because these are impure races full of inherited defects, and it is well known that inbreeding of inherited defects produces degeneration. On the other hand, the evidence is just as good that the inbreeding of pure races does not."—LEOPOLD.

"There is no evidence that inbreeding occurs in wild populations. . . . There is ample proof in the case of at least two of the quail that the fall shuffle does away with any necessity for and probably any possibility of inbreeding. . . . The work of geneticists on domestic animals indicates no deterioration through inbreeding, except where similar defects exist in both parents. . . . Ill results from inbreeding are not so much due to the kinship of blood as to the kinship of defect. When superior animals are individually adapted to each other and have no common weakness in their lineage, their common relationship has proved an advantage in producing superior progeny. It seems, then, that if inbreeding does occur it isn't necessarily deleterious."—KING.

In full agreement with this unanimous expression, a famous authority on quail, Herbert Stoddard, (1931) declares that in the progress of the Cooperative Quail Investigation conducted during 1924-29: "No evidence of harmful inbreeding was encountered in the five years of intensive field work in the Southeastern States." He continues: "So far as we are aware, it has never been definitely proved that inbreeding alone has ever been responsible for deterioration in any wild race, either of birds or of mammals, nor have laboratory experiments with the closest kind of inbreeding from *sound stock* through many generations indicated that such a condition is to be expected under natural conditions." Stoddard discusses conditions that "contribute to a thorough 'shuffling' of the stock before the nesting time. Hence there is little possibility of close inbreeding on normally stocked quail ground."

Thus, so far as the 'inbreeding theory' with related 'shoot-them-up' policy is concerned, there seems to be sufficient evidence to prove its fallaciousness. The consensus of many geneticists and conservationists, according to King of Scott's symposium, is "that there is no reason for believing that inbreeding occurs to any extent among wild animals, and second, there is no reason for believing that it would result in any great harm if it did occur."

On the other hand, Jull (1938) presents evidence to show that, in the case of chickens, "hatchability often decreased as the intensity of inbreeding increases. . . . The deleterious effects of inbreeding on hatchability are shown to be due largely to increased embryo mortality during the first four and especially the last three days of incubation." Crossbreeding, on the other hand, "tends to increase hatchability."

#### QUAIL BREEDING AT PATUXENT RESEARCH REFUGE

That intense inbreeding and crossbreeding of quail in captivity can produce results similar to that obtained with chickens is indicated by an experience of the writers in conducting nutrition studies with quail in the period 1939-42. Four experiments were conducted at the Patuxent Research Refuge, Bowie, Maryland, with breeding Bobwhites, to determine the optimum level of crude protein intake for maintenance and reproduction. In the first two experiments, involving 48 pairs of quail each, six protein levels from 13 to 23 per cent, inclusive, were compared; in the last two experiments, involving 96 pairs of quail each, six protein levels from 19 to 29 per cent, inclusive, were compared. The same levels of calcium, phosphorus and vitamin D were maintained in all four experiments. The approximate vitamin A and carotene content of the diets in International Units per pound of feed varied as follows: Exp. 1 — 10,800; Exp. 2 — 11,800; Exps. 3 and 4 — 16,800. The approximate riboflavin content in micrograms per pound of feed varied as follows: Exp. 1 — 2,000; Exp. 2 — 2,800; Exp. 3 — 2,600; and Exp. 4 — 2,200. The approximate thiamin potency of the diets in International Units per pound of feed was as follows: Exp. 1 — 250; Exp. 2 — 450; Exps. 3 and 4 — 550.

Two auxiliary experiments, designated as 2A and 3A, that were conducted simultaneously with Experiments 2 and 3, respectively, and had diets similar to those used in the latter experiments, gave data valuable for this discussion. Each consisted of 24 pairs of quail. Unfortunately, Experiment 3A had to be discontinued before the close of the breeding season because of need of its equipment for other purposes. Therefore the egg production record of this experiment is for only two-thirds of the season.

The initial stock of quail was of pen-reared birds from the Virginia State Game Farm at Camp Lee, Virginia. No breeding records were kept on them, but it is understood that they all came from the same strain of Bob-whites, namely, those propagated by Colonel Schwenck of Petersburg, Virginia. These birds were placed directly on Experiment 1.

The hatch of the eggs from eight of the 48 pairs was exceptionally good in comparison with the others. Therefore, offspring from these eight pairs were saved for Experiment 2. As shown in Table 1, 36 pairs of quail on Experiment 2 consisted of brothers and sisters, and 12 pairs consisted of males mated to unrelated females (so far as our records indicate), both from the select 'eight.' The birds used in

TABLE 1  
HATCH OF EGGS FROM OFFSPRING OF QUAIL WITH EXCELLENT RECORD OF PERFORMANCE  
(EXPERIMENT 2)

Pedigree No.	Hatch (%) of eggs from parents during previous year	Number of pairs		Hatch (%) of eggs from daughter mated to	
		Sib matings	Out- bred	Brother	Unrelated male
F 103	95	10	6	59	73
B 29	93	6	1	55	76
E 95	93	6	1	34	50
B 21	78	6	0	41	—
D 31	90	3	0	46	—
E 75	82	1	3	39	55
F 83	75	3	1	37	38
E 79	81	1	0	33	—

Experiment 2A were mated at random without regard for the record of the parents; a few of the birds were inadvertently taken from the select group.

The 192 quail used in Experiment 3, conducted in 1941, consisted of the following stock:

1. Young stock, offspring of:
  - (a) outbred breeders on Experiment 2A..... 96
  - (b) outbred breeders on " 2 ..... 18
  - (c) inbred breeders on " 2 ..... 1
  - (d) outbred breeders off experiment..... 5
2. Young males from Oxford, Pa..... 48
3. Female yearlings from Experiments 2 and 2A..... 24

The 24 female yearlings, together with the same number of young females, were paired off with Pennsylvania males, obtained by exchange from a large quail breeder in that state, whereas the rest of the local stock was paired off at random.



In Experiment 3A, half of the pairs consisted of brothers and sisters that were offspring of the sib matings made during the previous year; the other half consisted of female offspring from the aforementioned sib matings, crossed with Pennsylvania quail.

The birds in Experiment 4 were mated at random without regard for pedigree. However, yearlings were paired together, and young birds together.

### RESULTS

Inasmuch as 161 of the 1278 chicks (12.6 per cent) that hatched in Experiment 1 were helped out of their shells because of their inability to hatch by their own strength, the percentage of hatch as given in Table 2 is high. If all of these assisted chicks were considered as dead

TABLE 2  
REPRODUCTION OF BOB-WHITE ACCORDING TO SEVERAL METHODS OF BREEDING

Year	1939	1940			1941				1942
Experiment No.	1	2		2A	3		3A*		4
Breeding	Outbred	Inbred-sibs	Outbred-special	Outbred	Outbred	Crossbred	Inbred-sibs F from sibs- lings	Crossbred- F from sibs × Pa. quail	Outbred
Eggs produced during season; average number	43	41	41	47	52	60	32	41	65
Fertile eggs, per cent	94	89	92	90	93	93	88	94	94
Hatchable fertile eggs, per cent	82	49	66	76	69	70	66	64	79

\* Experiment 3A was conducted for only two-thirds of the breeding season.

in the shell, the percentage of hatch would drop from 82 to 71, and thereby be comparable to the hatch of eggs from the outbred quail of the subsequent year. Likewise the percentages given in the second column of Table 1 would be somewhat lower. In 1940, only 18 chicks were assisted out of the shell, and thereafter the practice was discontinued.

However, even when the percentage of hatch for 1939 is left at the higher figure, the difference between that and the hatch of eggs from the outbred birds in Experiment 2A is not statistically significant.

The difference between the hatch of the outbred birds in Experiment 2 as well as Experiment 2A, and that of the inbred breeders in Experiment 2, is highly significant (odds of 99 : 1 by Fisher's *t* test),

whereas the difference in hatch between the two groups of outbred quail is not significant. Table 1 shows that in the case of offspring from Mating No. F 103, those that were outbred showed 16 per-cent-units better hatch for their eggs than those that were inbred. Differences in production and fertility of eggs for 1939 and 1940 were inconsequential.

In 1941 the hatch on both breeding experiments, 3 and 3A, showed parity with that of the outbred stock of 1940. Singularly, in Experiment 3A the hatching results from the inbred siblings, F generation of the sib matings of 1940, were as good as that from the cross matings. The egg production, however, was significantly lower. Once again, fertility was not affected by the methods of mating.

The results in 1942 are considered normal for pen-reared quail. Egg production was higher than in any of the previous years but not unusually so. Hatchability as well as fertility of the eggs was very good in the light of other propagators' records.

Eight females from Experiment 2, six from brother-sister matings and two from out-matings, were continued as breeders in Experiments 3 and 4. In 1941 they were crossbred with the Pennsylvania strain of Bob-white, and in 1942 they were outbred with quail from Patuxent Research Refuge. Table 3 shows a progressive improvement throughout the three years, from 50 to 81 per cent in the hatch of eggs from

TABLE 3

HATCH OF EGGS FROM QUAIL HENS THAT WERE INBRED IN 1940, CROSSBRED IN 1941  
AND OUTBRED IN 1942, COMPARED WITH THOSE FROM HENS OUTBRED  
ALL THREE YEARS

Bird No.	Pedigree No.	Year			
		1940		1941	1942
		Inbred or Outbred	% hatch	% hatch	% hatch
237	B 29	Inbred	56	82	91
202	F 103	Inbred	57	72	79
707	F 83	Inbred	21	55	67
826	F 103	Inbred	54	67	76
457	F 103	Inbred	73	76	97
588	E 79	Inbred	33	86	77
(Weighted	average)	Inbred	50	73	81
256	E 71	Outbred	69	66	67
333	F 103	Outbred	81	75	80
(Weighted	average)	Outbred	75	70	74

the first group, whereas no improvement occurred in the hatch of the second group.

#### DISCUSSION AND CONCLUSION

The observations herein reported were not made on experiments designed as genetic or breeding studies (with the exception of Experiment 3A), but as dietary studies. Therefore there are certain weaknesses in the data that demand further investigation especially planned on this subject before conclusions can be drawn. However, the results reported in this paper do indicate that close breeding of quail can have deleterious effects on reproduction.

The brother-and-sister matings herein reported were forced upon quail in captivity by the whims of man. In the wild, it is doubtful that any appreciable number of birds would mate as closely as the twelve pairs in Experiment 3A.

The one condition in the wild under which inbreeding might play a deciding rôle, is when a species has been decimated to such few members that inbreeding is the only hope of survival. One notable example is the complete destruction of the Heath Hen, or 'Eastern Pinnated Grouse.' At one time this bird was found in large numbers in Massachusetts, southern New Hampshire, New York, Pennsylvania, and New Jersey. Its last stand was on the island of Martha's Vineyard, Massachusetts, where it existed for many years after its extirpation in other sections of the country. In 1930, only one bird of this species could be found there. The Passenger Pigeon shared a similar fate; and the beautiful Trumpeter Swan may soon follow these ill-fated creatures into oblivion. Close breeding may contribute to the final demise of a species.

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## FIRST-WINTER PLUMAGES IN THE GALLIFORMES

BY GEORGE A. PETRIDES

As is well known, the typical post-juvenal wing of the Galliformes differs from that of most birds in that the outer two pairs of juvenal primaries are not replaced by adult remiges at the post-juvenal molt but are carried until the second autumn. In a recent investigation of age criteria for gallinaceous game birds (Petrides, 1942), however, it was noted that this feature, which identifies young of the year in most species, did not apply to all Galliformes and that considerable variation also occurred in the number of juvenal greater primary coverts retained. It was particularly noted that the pheasants and European quails, which have been placed in the same subfamily in recent revisions of the order, undergo radically different types of post-juvenal molt.

Intrigued by the findings for native and naturalized American species, a study of the entirely exotic forms was also planned, but time limitations and lack of suitable specimen material eventually permitted only a cursory investigation of these groups. Because it seems quite unlikely that the project will be resumed, however, the limited findings in these foreign groups are also presented here as a possible aid to future investigators.

Reference to Table 1 will indicate the types of post-juvenal molt in the several groups of the Galliformes; the more detailed notes beyond list the evidence (not always complete) upon which the table is based. Variation in the size of the outermost greater primary covert as described in the table may also be of taxonomic importance. Some aspects of this matter were discussed in an earlier note (Petrides, 1943).

For American birds: Native quails retain the two outer juvenal primaries and the entire series of primary coverts; turkeys keep their distal primaries but no coverts. All grouse and the introduced Hungarian and Chukar partridges retain the outer two flight feathers and their coverts, but the imported Ring-necked Pheasant sheds and replaces all primaries and all coverts.

The types of molts occurring in the pheasants and quails agree more closely with the classification of these groups given by the 1931 A. O. U. Check-List than with the more recent revisions of the Galliformes (Peters, 1934; Wetmore, 1940; American Ornithologists' Union, 1944). In the Check-List, the American and European quails formed the two subfamilies of the family *Perdixidae*, while the pheasants alone comprised the *Phasianidae*. The recent classification is shown in Table 1.

TABLE 1

## POST-JUVENAL MOLTS IN THE GALLIFORMES

Classification (Peters, 1934)	Juvenal primaries retained	Juvenal primary coverts retained	Outer covert type*
Suborder GALLI			
Superfamily CRACOIDEA			
Family MEGAPODIIDAE (Megapodes)	Outer 2?	Outer 2?	No. 4, few No. 2
Family CRACIDAE (Chachalacas, guans)	Outer 2?	?	No. 2
Superfamily PHASIANOIDEA			
Family TETRAONIDAE (Grouse)	Outer 2	Outer 2	No. 1
Family PHASIANIDAE			
Subfamily ODONTOPHORINAE (American quails)	Outer 2	All	No. 1
Subfamily PHASIANINAE			
European quails	Outer 2	Outer 2	No. 1
Pheasants	None	None	No. 2, some No. 1, Pavo (peacock) No. 4
Family NUMIDIDAE (Guinea fowls)	Outer 2?	Outer 2?	Mostly No. 3
Family MELEAGRIDIDAE (Turkeys)	Outer 2	None	No. 4
Suborder OPISTHOCOMI			
Family OPISTHOCOMIDAE (Hoatzins)	?	?	No. 4

\* No. 1. Outermost covert rudimentary, wedge-shaped, often barely evident.

No. 2. Outermost covert of normal width but short, easily seen.

No. 3. Outermost covert as long as its neighbor but slim and pointed.

No. 4. Outermost covert full sized, matching its neighbors.

**FAMILY MEGAPODIIDAE.**—Little evidence was found among 38 skins of *Megapodius nicobariensis* from Celebes to indicate that any juvenal primaries are retained in the post-juvenal plumage. Several undated specimens of *M. reinwardt* from Australia, however, appeared to be young of the year with short, pointed outer two primaries and worn outer coverts.

**FAMILY CRACIDAE.**—In young chachalacas (*Ortalis vetula*) from Mexico, the two outermost pairs of pointed juvenal primaries are apparently retained until the February or early March following hatching, when a complete molt of the flight feathers takes place. No data were obtained on covert retention. Specimens of other Cracidae yielded no positive information.

**FAMILY TETRAONIDAE.**—All North American grouse, prairie chickens and ptarmigan apparently retain the outer two pairs of juvenal primaries and their coverts during the first winter. This seemed to be true also for specimens of the exotic genera *Tetrao phasis* and *Tetrao gallus*. The Committee of Inquiry on Grouse Disease (1911) found the outer primaries retained in young Red Grouse (*Lagopus scoticus*) of the British Isles.



FAMILY PHASIANIDAE.—Van Rossem (1925) was evidently the first investigator to determine that, in addition to the outer two juvenal primaries, the entire series of juvenal greater primary coverts are retained through the first winter by members of the Odontophorinae. This feature is easily apparent in all the quails of the United States and in specimens of *Odontophorus gujanensis* from Panama (4000'). Sufficient specimens of other tropical Odontophorinae were lacking.

In the Phasianinae, the retention of the outer two juvenal primaries was determined for the Hungarian Partridge (*Perdix perdix*) as early as 1788 (Bureau, 1911) and 1792 (Portal and Collinge, 1932). It has been used as a criterion of age since then. Bureau also found (1913) that the outer two primaries are retained in first winter specimens of *Alectoris rufa* from France. For the European quails, the present investigation determined that these species and the young of the introduced Chukar Partridge (*A. graeca*) and several other species of *Perdix* retain the outer primaries and also keep the outer two pairs of greater coverts until their second autumn.

In contrast to Bent's (1932) and Witherby's (1941) statements that the outer two primaries of Ring-necked Pheasants (*Phasianus colchicus*) are more pointed than adult remiges and are kept through the first year, the American and Asiatic specimens examined had replaced all flight feathers and wing coverts at the post-juvenal molt. (A complete post-juvenal molt of the flight feathers in the Ring-necked Pheasant was also found by technicians of the Michigan Department of Conservation (personal letter). This was also true of the Reeves's Pheasant (*Syrnaticus reevesii*). Friedmann (1930) determined the post-juvenal molt of *Francolinus sephaena* from East Africa to be complete.

FAMILY NUMIDIDAE.—As was previously determined by Friedmann (1930), the guinea fowl (*Numida meleagris*) in Africa undergoes a complete post-juvenal molt. Specimens of this species naturalized in Haiti, however, apparently retain the worn outer two pairs of primaries and coverts until, at least, the April following hatching.

FAMILY MELEAGRIDIDAE.—The pointed and darkened tips of the outer two primaries of first year turkeys (*Meleagris gallopavo*) are distinctive. In the Florida subspecies (*M. g. osceola*), however, there seems to be a tendency to retain only the outermost primary. Normally, the greater coverts of the retained primaries are replaced at the post-juvenal molt but in an occasional young specimen they are kept. A few undated specimens of the Ocellated Turkey (*Agriocharis ocellata*) of tropical America showed indications of a typical *Meleagris* molt but complete material was lacking.

## FAMILY OPISTHOCOMIDAE.—No data.

In conclusion, the author wishes to thank Dr. Alexander Wetmore of the Smithsonian Institution for reviewing the manuscript and offering several valuable suggestions. Doctors Herbert Friedmann and John W. Aldrich were so kind as to permit him to study the collections at the U. S. National Museum under their care.

## SUMMARY

In native and naturalized American gallinaceous game birds, it was found that, during the first winter, native quails retain the two outer juvenal primaries and the entire series of greater primary coverts; turkeys keep their distal primaries but no coverts. All grouse and the introduced Hungarian and Chukar partridges retain the outer two flight feathers of the wing and their coverts, but the imported Ring-necked Pheasant sheds and replaces all primaries and all coverts. It was particularly noted that the pheasants and European quails, which have been placed in the same subfamily in recent revisions of the Galliformes, undergo radically different types of post-juvenal molts. Limited notes on the post-juvenal molt in other Galliformes are given and variation in the outermost greater primary covert is described.

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LAFRESNAYE<sup>1</sup>

BY THOMAS E. PENARD

*Plates 10-11*

NOËL-FRÉDÉRIC-ARMAND-ANDRÉ, BARON DE LA FRESNAYE, French ornithologist, was born on July 24, 1783, at the Château de La Fresnaye in Falaise, Département du Calvados, Normandie, France. He died in his ancestral home on July 14, 1861.

Frédéric de Lafresnaye, as he called himself, belonged to one of the most prominent and best families of France, which gave to Normandie historians and magistrates and to France military leaders and poets. He was a descendant of Jean, Vauquelin de La Fresnaye, celebrated French poet of the sixteenth century, presiding magistrate and Lieutenant Générale in the Baillage de Caen; and also of Nicolas, Sieur des Yveteaux, Lieutenant Générale at Caen, Preceptor to the Duc de Vendome (the son of Henri IV) and later to the Dauphin (Louis XIII). His father was André de La Fresnaye, Chevalier de Saint Louis, famous hippologist and author of historical works on Normandie and Falaise.

Born to fortune, Frédéric de Lafresnaye, like many another in his circumstances, might have lived a life of idleness and pleasure. From his earliest youth, however, he clearly showed higher aims in his pursuits. He had continually before him the good example of his distinguished father who gave much of his time to historical research.

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<sup>1</sup> The following paper was prepared by the late author following extensive research on the subject, but the manuscript was mislaid after his death (1936) and has only recently been found and submitted for publication.—Ed.

But young Lafresnaye was not destined to follow the footsteps of his father nor those of his illustrious ancestors. From the very beginning he directed his energies along other lines that pointed unmistakably to his love of nature. When the children of the neighborhood brought him small animals they had caught, he took keen delight in stuffing and mounting them, and this amusement soon became a passion with him.

During his early life he devoted himself not only to ornithology, but more especially to entomology, conchology, and geology. In his studies he had the good fortune to find, even within the boundaries of the town of Falaise, two excellent guides—M. de Bazoches and M. de Brébisson, the latter the father of the well-known botanist. Thus initiated into the branches of science which interested him most, Lafresnaye—young, active, independent—resolved to delve deeper into the mysteries of nature. It was then that he, in company with other young naturalists, under the leadership of M. Leon Dufour, made long, successful excursions into the Pyrenees, collecting day by day the specimens which formed the nuclei of his future magnificent collections.

There could no longer be any doubt about his lifework. Natural history became the chosen field of his intellectual pursuits. Irresistibly drawn, he yielded to its allurements and gradually widened the circle of his acquaintances with men of science. He came to know M. Dejean, the noted entomologist, and entered into correspondence with him, as a result of which his collections were enriched by many rare species. Entomology became his favorite study, and to it he applied the best part of his efforts.

At about this time, he married Mademoiselle de Bazoches, the daughter of one of his first masters in natural history. But his happiness did not last long, for his young bride died within a short time (about 1825), leaving him a daughter, Louise. To drown his sorrows, he applied himself more than ever to his scientific studies, and began a series of excursions into the Alps. While on one of these expeditions on the shores of Lake Bourzet in Savoie, he had an opportunity to buy a collection of European birds. Then and there he determined to devote his energies entirely to ornithology, and the few hundred birds of this humble collection became the nucleus of an ornithological cabinet that grew to be one of the most magnificent in Europe. Lafresnaye was thus more than forty-two years old when he decided to embark upon an ornithological career. Yet soon the ornithological journals began to receive valuable contributions from his pen.

But much as he loved his science, he loved his home more and



sought the happiness of family life in a second marriage. He married Mademoiselle Tsaure de Montbeillard, granddaughter of Guéneau de Montbeillard, distinguished litterateur and naturalist, friend of Buffon and collaborator with him in the ornithological part of his '*Histoire Naturelle*.'

With unusual devotion to his family and pride in the affairs of his native town, Lafresnaye continued his studies of the birds of the world. He left his fireside only for short excursions into his own and neighboring provinces, to the Pyrenees, the Alps, or to Holland and England. He never visited America, in whose birds he was so much interested, and never undertook long voyages to distant lands in quest of ornithological information. Rather he contented himself with the reports of naturalists who went on such expeditions, from which he was able to draw the interesting conclusions that attracted the attention of the scientific world and won for him the distinction he so richly merited.

When he came from his halls or his natural history galleries he enjoyed taking care of the waterfowl which he had introduced on his place when there was talk of a '*Jardin d'acclimation*.' He loved his trees, his flowers, and his gardens. As a private citizen, he was known to all in his native town. He had constantly at heart the welfare of his community and was a friend to all institutions of merit, ever ready to oblige and with a wholesome sympathy towards everything that might be of advantage or glory to the town he loved. This was clearly evident in the various assemblies in which he always took a prominent part, whether municipal, agricultural, or academic.

As a scientific man, Lafresnaye was considered one of the foremost ornithologists of his time. His opinion was frequently sought by his contemporaries, and his contributions to ornithological literature were of the greatest importance. He published chiefly in the: *Revue de Zoologie*, 1838-1848; *Magazin de Zoologie*, 1832-1845; *Revue et Magazin de Zoologie*, 1849-1856; *Écho du Monde Savant*, 1834-1837; *Séances Publiques*, 1832-1836; *Mémoires de la Société Académique*, 1836-?; *Dictionnaire Universelle d'Histoire Naturelle*, 1841-1844.

Minor writings are scattered in: *Mémoires de la Société Linneéenne*; *Ferussac Bulletin*; *Congrès Scientifique de France*; *Annuaire des cinq départements de l'ancienne Normandie*; *Annales de la Société Entomologique*; *Proceedings of the Zoological Society of London*; *Contributions to Ornithology* (of Wm. Jardine); and probably many other obscure publications.

Lafresnaye gave much time to a study of the species described by Vieillot in the '*Nouveau Dictionnaire d'Histoire Naturelle*.' This



work appears to have been neglected by the ornithologists of the early part of the nineteenth century and thus Lafresnaye was able to rectify errors in nomenclature and establish the priority of many of the names proposed by Vieillot, based on the works of Azara.

Soon after his interest in birds had largely obscured his other hobbies, he was invited by Alcide d'Orbigny to collaborate with him in the identification and classification of the splendid lot of birds brought back by this naturalist from South America, and with this circumstance appears to have begun his interest in American birds. From that time forward, he was a regular buyer from Boissonneau, Dupont, Parzudaki, Verreaux frères, and other dealers who were receiving birds from all over the world, particularly from México, the West Indies, Colombia, and other parts of South America.

He was greatly interested in the Tracheophones and more especially the Dendrocolaptidae. For many years he worked on this difficult family and finally published a valuable monograph of the entire group.

He gave particular attention to the structure and classification of birds and sought to establish the bearing of the structural characters of the bill and feet upon the habits of the species. He published several articles on this subject and, whenever occasion presented itself, called attention to relevant facts.

He collaborated with, or assisted, several ornithologists including Guérin-Ménéville—'Nouveaux Oiseaux d'Abysinnie'; Dubus—the authority is sometimes given as 'Lafr. et Dubus'; Des Murs—'Iconographie ornithologique'; Pucheran—some types in the Paris Museum bear the authority 'Lafr. et Pucheran'; Boissonneau—authority sometimes referred to by Lafresnaye, himself, as 'Boiss. et Lafresnaye.'

To Charles d'Orbigny's 'Dictionnaire Universelle d'Histoire Naturelle,' Lafresnaye contributed no less than 384 articles of various lengths. These are in the first four volumes. Subsequent volumes contain no items by him. It is interesting to note that Hartlaub, the well-known German ornithologist, expressed his disappointment when Lafresnaye withdrew as a contributor, saying that the articles by Lafresnaye were always full of interest, whereas those by his successor, Gérard, were valueless.

Lafresnaye also described new species of birds from collections other than his own, including the collection of the Paris Museum, that of Charles Brelay of Bordeaux, and also the Delattre collection which was bought by Dr. Wilson and presented to the Academy of Natural Sciences of Philadelphia, where the types now are. Altogether, he created at least 40 new genera and described nearly 500 new species and subspecies of which 161 were in collaboration with Alcide d'Or-

bigny. His known bibliography includes about 250 items exclusive of the separate articles, 384 in number, contained in d'Orbigny's 'Dictionnaire Universelle.'

Lafresnaye was a member of many learned societies. He was a founder of the Société Académique des Sciences, Arts, et Belles Lettres of Falaise, of which he was the president after the death of Pierre David. He was also one of the founders of the Société Cuvérienne and of the Journal de Conchyliologie. He was also a member in the following societies: L'Association pour les progrès de l'Agriculture de l'Industrie et de l'Instruction dans l'Arrondissement de Falaise, which merged with the Société Académique in 1837; L'Association Normande, the proceedings of which were recorded in the *Annuaire de cinq départements de l'Ancienne Normandie*; Société Linnéenne du Calvados; Société Linnéenne de Paris; Société Linnéenne des Antiquaires de Normandie; L'Institut des Provinces. In many of their meetings Lafresnaye took active part and read a number of papers, at least some of which were published. He represented the Société Académique at several congresses of learned societies at Paris and was invariably called upon to preside at one of the sessions. Even the year before his death, he attended one of these meetings and made important communications of which the *Annuaire des Cinq départements* has made mention.

At the Congrès Scientifique de France in 1833, Lafresnaye had indicated his intention of attending Section 1—Natural History, Section 5—Literature and Fine Arts and Section 6—Social Economy, showing his wide interest; but he was unanimously elected to preside over the Natural History section which undoubtedly took all his time, as there is no evidence in the records of the Congress of his participation in the activities of the other sections. He read several *Mémoires* at the Séances publiques de la Société de Normandie, held at Falaise (1834), Bayeux (1835), and elsewhere, and at the regular meetings of this society and the Société Linnéenne du Calvados. As a proof of the great esteem and confidence he inspired, he was appointed a member of the high commission to report on conditions and to recommend improvements and reforms in the vast collections in the Paris Museum. This committee, which was very small, consisted of the greatest scientific men of France.

Lafresnaye had many friends and held the admiration and respect of men of learning throughout the scientific world. His scientific relations and correspondence included the most distinguished ornithologists of the time. Letters he received bore ample testimony of the high esteem in which he was held. At one time or another he

was in communication with the following well-known naturalists: De Jean, Dufour, Bonaparte, Natterer, Schlegel, Sclater, Gray, Gould, Eyton, Wied Neuwied, Guérin Ménévill, Alcide d'Orbigny, Charles d'Orbigny, Lesson, Boissonneau, Jules and Edouard Verreaux, Pucheran, L'Herminier, Léotaud, and Des Murs. Always welcome at the Chateau de La Fresnaye, many of these men came to examine the specimens of his magnificent collection or to consult with him in matters of common interest.

In recognition of his scientific achievements and his service to the public, Lafresnaye was made a Chevalier de la Légion d'Honneur, and the French government, in conferring upon him this great distinction, honored itself no less.

#### COLLECTIONS

The Lafresnaye collections of natural history specimens were housed on the first floor in the right hand end of the chateau, for which an extension had apparently been necessary. In a letter to me, M. Christian de La Fresnaye, the son of our ornithologist, wrote (translated): "You do not need to thank me for the very incomplete information I give you. It is I who owe to you the pleasure of recalling the time when as a boy I roamed through my father's galleries, among his many birds, which I all but forget now, and which I see again in my mind—

"The Calao with its big bill, the Goatsucker with its enormous mouth, the Secretary, a big bird with its feet on a snake, the long-legged Flamingo with its head hanging down . . . etc., etc., old friends with whom I was loath to part when they were taken away."

Four years after Lafresnaye's death on September 4, 1865, his collections were sold at public auction. According to a notice in the *Revue et Magazin de Zoologie*, there were a bird collection consisting of 9000 specimens and containing about 700 types, and a collection of shells consisting of 25,000 specimens. In addition, there were also collections of birds' eggs, birds' nests, and insects. M. Jousseau, French conchologist and a friend of M. Bureau of Nantes, vaguely remembers that the shells were sold to an English dealer, Sowerby, Wright, or Damon. M. Husnot, a botanist who had heard of the coming auction from M. de Brébisson, was present. He said that many had come to attend the sale which was to last about a week. Among these was M. Milne-Edwards of the Paris Museum. But on the day of the sale, when all had gathered at the chateau, it was announced that the entire bird collection had been purchased by the City of Boston. We know, of course, that the buyer was Dr. Henry





LAFRESNAYE (BARON FRÉDÉRIC DE LA FRESNAYE).

FROM A CRAYON SKETCH, THROUGH THE COURTESY OF THE MUSEUM OF NATURAL HISTORY OF NANTES.





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Bryant, who attended personally to the packing and shipping of the specimens and presented the entire collection to the Boston Society of Natural History.

M. Husnot bought some hummingbirds, about 100 nests which he distributed among his friends, and the collection of birds' eggs, which he got very cheaply—all but two eggs of the Cassowary which commanded a very high price. The eggs were mostly of exotic birds, the names of which were usually, but not always, written on the larger shells. Husnot remarks that Lafresnaye probably never studied his birds' eggs. A catalogue of the ornithological collection intended for use at the auction had been prepared by Jules Verreaux, who remained at the Château three months to do the work.

The bird collection is now in the Museum of Comparative Zoölogy. The specimens have been taken from their mounts, straightened, and properly distributed in the cases. A large scrapbook contains the labels which were taken off the stands and pasted in the book. For many of the specimens there were several labels containing remarks by Lafresnaye. It was apparently his custom to make out new labels whenever the status of the species had been subject to change. Many manuscript names are to be found on these labels, at least some of which would have been valid today had Lafresnaye seen fit to publish them with proper descriptions of the species.

His library was less extensive and, according to M. Husnot, contained no works on botany. A list of the scientific books prepared for the sale contained volumes on entomology, ornithology, conchology, and general subjects. In the copy in the Library of the British Museum, there is an article by O. Des Murs in which he praises the work of Lafresnaye and remarks that his collection of birds as a whole surpassed that of Prince de Massena, whom he recalls meeting at Lafresnaye's home and who marvelled at the richness of the Lafresnaye collection. He adds that the collection, containing types worth their weight in gold, should not be dispersed at a detailed public auction but that it should find a purchaser to buy it as a whole for his own cabinet or for his country.

We cannot go into further details here, but let me say in closing that it is remarkable that an ornithologist whose work dealt so largely with American birds should be so little known here or, for that matter, elsewhere. American Ornithology owes much to Frédéric, Baron de Lafresnaye.

*Arlington*  
*Massachusetts*

NOTES ON BIRDS OF NORTHERN NEWFOUNDLAND  
AND LABRADOR

BY EVARTS G. LOOMIS

THESE notes on the birds of northern Newfoundland and casual observations from Labrador were made during a five-year sojourn in these parts while engaged in medical work for the Grenfell Mission. The periods from June, 1936 to February, 1937, from June, 1939 to August, 1941, and from June, 1942 to June, 1944, were spent at St. Anthony near the northern tip of the island and twenty miles south of the Straits of Belle Isle. The notes from Labrador were made during a six-weeks stay at Indian Harbor in the summer of 1935 and also on two subsequent trips on board the mission medical yacht, going as far as Cartwright in 1936 and Northwest River in 1940.

Indian Harbor is a small rocky island at the entrance of Hamilton Inlet. The following birds were regularly seen there during the summer and were breeding there or on the neighboring islands: the Semipalmated Plover, the White-rumped Sandpiper, the Northern Horned Lark, the Northern Raven, the Pipit, the Savannah Sparrow and the White-crowned Sparrow. The short Labrador list includes only those records which were considered of interest in extending fall migration dates as recorded by Austin (AUSTIN, OLIVER L., JR. 'The Birds of Newfoundland Labrador,' Mem. Nuttall Ornith. Club, 1: 1-229, 1932) and one or two other items.

St. Anthony is one mile from the coast on a well-protected harbor. The terrain of the region is very barren and covered with snow from November to June. These northern harbors are blocked with ice flows making navigation impossible five months of the year. The trees, chiefly spruce, fir and birch, are stunted near the coast with good stands of timber inland and along the foot of the bays.

During the period of these records, note was made of all birds seen, giving special attention to migration dates. The land birds, always nearer at hand, could be observed much more closely than the water birds. Notes on the latter, which are by no means complete, were made during the course of medical trips by boat along the coast and also on shorter overland hikes. As it was impossible to leave the hospital for more than a few hours at a time, I was unable to get back into the marshy interior and make any notes on the breeding water birds.

Whenever the local name in use among the Newfoundland fishermen was known it has been included. The general remarks and dates without reference to place refer to the St. Anthony region. Except as



TEXT-FIGURE 1.—Sketch map of northern Newfoundland and southeastern Labrador.



noted, all records are sight observations. The number of birds seen at a particular time has sometimes been included in parentheses following the date of observation. Included in the list are the occasional records of: H. Peters, the Atlantic Flyway Biologist and T. Burleigh, his associate while in Newfoundland during the summer of 1943; Dr. E. Burge, a medical associate during the season of 1936 who, like myself, is an amateur ornithologist and former bird-bander; and S. Cooper, a local minister and naturalist who is thoroughly familiar with the waterfowl. The notes followed by an asterisk refer to information that I gained from local inhabitants while discussing the birds and their habits by their local names and reference to Fuertes's plates. The notes from St. John's Bay were given me by an extremely observant young lumberman and fisherman who was thoroughly familiar with the local bird life of the region.

## NORTHERN NEWFOUNDLAND

1. *Gavia immer immer*, COMMON LOON ("Loo").—Common, breeding on interior ponds. Summer resident.
2. *Gavia stellata*, RED-THROATED LOON ("Whabby").—Common and breeding on interior ponds; June to September.\*
3. *Puffinus griseus*, SOOTY SHEARWATER ("Hagdown").—Common migrant seen in all months from June to October, on stormy days, particularly just off the coast. Particularly common in the Straits of Belle Isle. Usually seen singly or in pairs and associating with the next species.
4. *Puffinus gravis*, GREATER SHEARWATER ("Hagdown").—Abundant in Straits of Belle Isle. Often seen in large flocks.
5. *Fulmarus glacialis glacialis*, ATLANTIC FULMAR ("Noddy").—Seen frequently in small flocks offshore during the summer and fall. St. Anthony, October 8, 1936; specimen collected.
6. *Oceanodroma leucorhoa leucorhoa*, LEACH'S PETREL ("Mother Carey's Chicken").—Abundant in Straits of Belle Isle during summer. St. Anthony, October 8, 1936; specimen collected. Harbor Deep, June 21, 1941.
7. *Morus bassana*, GANNET.—Fairly common off northeast coast. Not known to breed. Griguet, September 20, 1936; October 10, 1943; Hare Bay, September 13, 1943.
8. *Phalacrocorax auritus auritus*, DOUBLE-CRESTED CORMORANT ("Shag").—Fairly common locally. Baie Verte, September 7, 1943 (six). Harbor Deep, September 12, 1943.
9. *Botaurus lentiginosus*, AMERICAN BITTERN.—Fairly common summer resident.
10. *Branta canadensis canadensis*, COMMON CANADA GOOSE.—Nesting commonly in Canada Bay region.\*
11. *Anas rubripes*, BLACK DUCK.—Migrating in late fall. A few winter. Nests commonly in interior ponds near Ship Cove and Hare Bay.\* Hare Bay, March 17 and 24, 1940; August 10, 1943.
12. *Anas carolinensis*, GREEN-WINGED TEAL ("Teal").—Nesting, Ship Cove and Hare Bay regions.\* Hare Bay—eight specimens (Cooper).

13. *Clangula hyemalis*, OLD-SQUAW ("Houn").—Common winter visitor. Hare Bay, June 12, 1943.
14. *Histrionicus histrionicus*, EASTERN HARLEQUIN DUCK ("Lord and Lady").—Rare visitor.\* Fairly common St. John's Bay.\*
15. *Somateria mollissima*, EIDER ("Canvasback"; "Shore Duck").—Abundant in migration and winter. A few breed. St. Anthony, December 22, 1936; (*S. m. borealis*).
16. *Somateria spectabilis*, KING EIDER ("King Drake").—Rather common, January to May, arriving later than *S. mollissima*. Commonly associated with the heavy pack-ice of this season.\*
17. *Melanitta fusca deglandi*, WHITE-WINGED SCOTER ("White-winged Diver").—Fairly common summer resident. Breeds Hare Bay.\* St. Anthony, June 21, 1942.
18. *Mergus merganser americanus*, AMERICAN MERGANSER.—Harbor Deep, June 11, 1941 (breeding).
19. *Mergus serrator*, RED-BREASTED MERGANSER ("Shell Bird").—Common summer resident, breeding in Hare and Canada bays.\*
20. *Accipiter cooperii*, COOPER'S HAWK.—St. Anthony, September 30, 1943.
21. *Buteo lagopus s. johannis*, AMERICAN ROUGH-LEGGED HAWK.—St. Anthony, July 1, 1943.
22. *Haliaeetus leucocephalus washingtoniensis*, NORTHERN BALD EAGLE ("Grepe").—Uncommon resident. Hare Bay, April 30, 1941.
23. *Pandion haliaetus carolinensis*, OSPREY (also "Grepe").—Fairly common. Wild Cove, September 10, 1943. Canada Bay, June 7, 1942.
24. *Falco peregrinus anatum*, DUCK HAWK.—St. Anthony, October 14, 1939.
25. *Falco columbarius columbarius*, EASTERN PIGEON HAWK.—Much the commonest hawk of this region. Breeds abundantly along the east coast from St. Anthony to Hampden. Summer resident.
26. *Falco sparverius sparverius*, EASTERN SPARROW HAWK.—One record. Very careful identification at close range. St. Anthony, August 16, 1936.
27. *Lagopus lagopus alleni*, ALLEN'S PTARMIGAN.—Common permanent resident. Much sought for food.
28. *Lagopus mutus welchi*, WELCH'S PTARMIGAN.—St. Anthony, February 6, 1941. Seen on higher hills about St. John's Bay.\*
29. *Rallus limicola limicola*, VIRGINIA RAIL.—One record. Careful identification at close range (Burge). St. Anthony, August 16, 1936.
30. *Charadrius hiaticula semipalmatus*, SEMIPALMATED PLOVER.—Common fall migrant. Probably breeds. St. Anthony, August 27–September 18. Hare Bay, July 10, 1943.
31. *Charadrius vociferus vociferus*, KILLDEER.—One record. Observed carefully at close range. First noted by its familiar call. St. Anthony, November 19, 1940.
32. *Squatarola squatarola*, BLACK-BELLIED PLOVER.—Quirpon, August 17, 1936 (three).
33. *Capella delicata*, WILSON'S SNIFE.—Very abundant, breeding in the marshes about St. Anthony. St. Anthony, April 21–October 27. Mating call first heard, May 18.
34. *Numenius phaeopus hudsonicus*, HUDSONIAN CURLEW.—Fairly common locally in migration and undoubtedly breeding. Quirpon, July 24, 1936; September 10, 1940. Hare Bay, June, 1943 (Cooper).

35. *Actitis macularia*, SPOTTED SANDPIPER.—Common summer resident. St. Anthony, June 21–August 26.
36. *Totanus melanoleucus*, GREATER YELLOW-LEGS ("Anseres").—Breeding in Hare Bay.\* St. Anthony, common in migration; August–September. La Scie, September 5, 1943. Harbor Deep, September 8, 1943.
37. *Erolia fuscicollis*, WHITE-RUMPED SANDPIPER.—Very abundant in migration. Frequently seen on pastureland in flocks. St. Anthony, October 11–November 22.
38. *Erolia minutilla*, LEAST SANDPIPER.—St. Anthony, August 27, 1939.
39. *Erolia alpina sakhalina*, RED-BACKED SANDPIPER.—St. Anthony, August 29, 1939. Observed in a group of shore birds. It was carefully studied at close range with respect to the shape of the bill and the size.
40. *Phalaropus fulicarius*, RED PHALAROPE.—Uncommon along this coast although possibly unidentified in fall plumage. Several careful identifications in fall have all been of the northern variety. Hare Bay, offshore about two miles, June 6, 1941 (twenty).
41. *Lobipes lobatus*, NORTHERN PHALAROPE ("Gale Bird").—Abundant along coast in fall migration. St. Anthony, September–October. Straits of Belle Isle, September 29, 1940 (several flocks). Baie Verte, September 6, 1943.
42. *Larus hyperboreus*, GLAUCOUS GULL ("Slob Gull").—Common in fall, winter and spring, especially when the drift (slob) ice is just offshore. Canada Bay, June 6, 1942. Cape Bauld, October 10, 1943.
43. *Larus marinus*, GREAT BLACK-BACKED GULL ("Saddleback").—Common permanent resident.
44. *Larus argentatus smithsonianus*, HERRING GULL ("Blue").—Common in spring, summer and fall.
45. *Pagophila eburnea*, IVORY GULL ("Ice Partridge").—This gull is associated with the coldest winter days and a pure white landscape. St. Anthony, December 1, 1940 (an unusually early date). Pistolet Bay, February 8, 1940.
46. *Rissa tridactyla tridactyla*, ATLANTIC KITTIWAKE ("Ticklelouse").—Abundant fall migrant. Used for food when ducks are scarce. Attracted to the fishing boats by the fishermen's calling "yitti, yitti . . ." St. Anthony, September–December. Less common in spring.
47. *Sterna hirundo hirundo*, COMMON TERN ("Steern").—St. Anthony, common in migration; August 28–November 14. Breeding about Ship Cove and Green Island in the Straits of Belle Isle. (My records do not give the relative numbers of this species as compared with the Arctic Tern.)
48. *Alca torda*, RAZOR-BILLED AUK ("Tinker").—Occasional visitor but rather uncommon off the northeastern coast.\* More common in the Gulf of St. Lawrence.
49. *Uria aalge aalge*, ATLANTIC MURRE ("Turr").—Abundant in fall, winter and spring. Used extensively for food.
50. *Uria lomvia lomvia*, BRÜNNICH'S MURRE ("Murre").—St. Anthony, December 11, 1942. Much less common than the preceding species.
51. *Plautus alle*, DOVEKIE ("Bullbird").—Very common winter resident. Very tame, often swimming very close alongside the boats. St. Anthony, October 9 (earliest date). Straits of Belle Isle, September 29, 1940.
52. *Cephus grylle grylle*, BLACK GUILLEMOT ("Sea Pigeon").—Common permanent resident. Nesting commonly on most of the rocky islands of this region.
53. *Fratercula arctica arctica*, ATLANTIC PUFFIN.—Occasional off the northeast coast

- of Newfoundland. Much more common in the Straits of Belle Isle, particularly on the Labrador side.
54. *Bubo virginianus heterocnemis*, LABRADOR HORNEO OWL.—Ship Cove, occasional.\* St. John's Bay common.\*
  55. *Nyctea scandiaca*, SNOWY OWL ("White Owl").—Frequent winter visitor. St. Anthony, January 17, 1936, February 2, 1936; February 11, 1936; January 1, 1943. Ship Cove, January 3, 1944 (two).
  56. *Asio flammeus flammeus*, SHORT-EARED OWL.—Quirpon, May 30, 1943 (Peters and Burleigh).
  57. *Megasceryle alcyon alcyon*, EASTERN BELTED KINGFISHER.—Harbor Deep, June 9, 1941. St. John's Bay, common.\*
  58. *Colaptes auratus*, FLICKER.—Occasional visitor. St. Anthony, August 9, 1936; October 10, 1936; May 18, 1941. La Scie, September 4, 1943.
  59. *Sphyrapicus varius varius*, YELLOW-BELLIED SAPSUCKER.—One record. St. Anthony, August 2, 1936 (Burge).
  60. *Dryobates villosus terraenovae*, NEWFOUNDLAND WOODPECKER.—Hare Bay, January 7, 1937. St. John's Bay, common.\*
  61. *Dryobates pubescens medianus*, NORTHERN DOWNY WOODPECKER.—St. John's Bay, common.\*
  62. *Otocoris alpestris*, HORNEO LARK ("Mud Lark").—Fairly common visitor in migration but by no means as common as the Snow Bunting. It is not usually seen associated with the buntings as it is in the United States. Cape Bauld, October 10, 1943. St. Anthony, occasional in fall; records lacking.
  63. *Perisoreus canadensis nigricapillus*, LABRADOR JAY.—Abundant in wooded areas including Hare Bay, Canada Bay and Hooping Harbor.
  64. *Corvus corax principalis*, NORTHERN RAVEN ("Crow").—Common permanent resident.
  65. *Parus atricapillus atricapillus*, BLACK-CAPPED CHICKADEE.—Common permanent resident.
  66. *Parus hudsonicus littoralis*, ACADIAN CHICKADEE.—Common permanent resident.
  67. *Sitta canadensis*, RED-BREASTED NUTHATCH ("Upside-down Bird").—St. Anthony, August 3, 1939. Only record until 1943; October 15, 1943 to February 14, 1944, abundant. St. John's Bay, common.\*
  68. *Troglodytes troglodytes hiemalis*, EASTERN WINTER WREN.—Common from Canada Bay, southward. St. Anthony, uncommon, May 8, 1944. Daniel's Harbor, March 1, 1936. Canada Bay, June 7, 1941. Williamsport, June 8, 1941.
  69. *Turdus migratorius nigrideus*, BLACK-BACKED ROBIN.—St. Anthony, common summer resident. April 15 to November 8.
  70. *Hylocichla guttata faxoni*, EASTERN HERMIT THRUSH.—Common summer resident. St. Anthony, April 24 to October 24.
  71. *Hylocichla minima aliciae*, GRAY-CHEEKED THRUSH.—Common summer resident. St. Anthony, June 3 to late August.
  72. *Regulus satrapa satrapa*, EASTERN GOLDEN-CROWNED KINGLET.—Rare. St. Anthony, October 17, 1940.
  73. *Regulus calendula calendula*, EASTERN RUBY-CROWNED KINGLET.—Common summer resident. St. Anthony, May 3 to October 3.
  74. *Anthus spinoletta rubescens*, AMERICAN PIPIT.—Common in migration at St. Anthony, May 16 to June 27; August 27 to ?.
  75. *Lanius excubitor borealis*, NORTHERN SHRIKE.—Uncommon. St. Anthony, April 6-17, 1943 (seen each day in our yard). Hare Bay, February 1, 1936.

76. *Vireo olivaceus*, RED-EYED VIREO.—One record. St. Anthony, July 7-9, 1940. (This is a certain record as the bird was picked up by its song and then observed at close range.)
77. *Dendroica aestiva amnicola*, NEWFOUNDLAND YELLOW WARBLER ("Yellow-hammer").—Fairly common summer resident. St. Anthony, June 5 (earliest date).
78. *Dendroica coronata coronata*, MYRTLE WARBLER.—Uncommon, St. Anthony, April 25, 1943. Canada Bay, June 7, 1941.
79. *Dendroica pensylvanica*, CHESTNUT-SIDED WARBLER.—Canada Bay, June 7, 1941.
80. *Dendroica striata*, BLACK-POLL WARBLER.—Common summer resident. St. Anthony, June 7 to August 30.
81. *Seiurus noveboracensis noveboracensis*, NORTHERN WATER-THRUSH.—Common summer resident. St. Anthony, May 25 to September 7.
82. *Wilsonia pusilla pusilla*, WILSON'S WARBLER.—Common summer resident. St. Anthony, May 28 to September 4.
83. *Euphagus carolinus*, RUSTY BLACKBIRD.—St. Anthony, April 28 to May 6, 1941 (one bird seen daily).
84. *Pinicola enucleator leucura*, CANADIAN PINE GROSBREAK ("Mope").—Common permanent resident. In full song and mating in early April. One specimen taken on October 3, 1936, was, according to measurements, *P. e. leucura* rather than "*eschalosus*."
85. *Acanthis hornemanni exilipes*, HOARY REDPOLL.—Not uncommon in migrating flocks of redpolls. St. Anthony, October 18 to December 19, and probably later.
86. *Acanthis linaria linaria*, COMMON REDPOLL ("Sprucebird").—Common the year round, breeding here in large numbers. These birds gather into large flocks for migration during October and early November. Our winter redpolls wintering here are probably from farther north.
87. *Acanthis linaria rostrata*, GREATER REDPOLL.—Occasional in flocks of the preceding subspecies. St. Anthony, October 2, 1936; October 2, 1940; April 23, 1940.
88. *Loxia leucoptera leucoptera*, WHITE-WINGED CROSSBILL.—Seen here commonly in the winter of 1943-1944 but at no time before. St. Anthony, October 14 to February 10, 1944.
89. *Passerculus sandwichensis*, SAVANNAH SPARROW.—Common summer resident. St. Anthony, May 16 to October 11.
90. *Junco hyemalis hyemalis*, SLATE-COLORED JUNCO.—Fairly common in spring, summer and fall. Occasional winter straggler. Ship Cove, February 12, 1940.
91. *Spizella arborea arborea*, EASTERN TREE SPARROW.—Rather uncommon. St. Anthony, July 5, 1936; October 9, 1940 (banded).
92. *Spizella passerina passerina*, EASTERN CHIPPING SPARROW.—One record. St. Anthony, June 22, 1943 (Burleigh and Peters).
93. *Zonotrichia leucophrys leucophrys*, WHITE-CROWNED SPARROW.—Common summer resident. St. Anthony, June 1 to October 5.
94. *Zonotrichia albicollis*, WHITE-THROATED SPARROW.—Common summer resident. St. Anthony, May 10 to October 5.
95. *Passerella iliaca iliaca*, EASTERN FOX SPARROW.—Commonest breeding landbird. St. Anthony, April 14 to October 27.
96. *Melospiza lincolni lincolni*, LINCOLN'S SPARROW.—Common summer resident. St. Anthony, June 1 to September 19.



97. *Melospiza georgiana*, SWAMP SPARROW.—Fairly common summer resident. St. Anthony, May 28 to September 19.
98. *Plectrophenax nivalis nivalis*, EASTERN SNOW BUNTING.—Common in migration. Occasional winter straggler. St. Anthony, March 27 to May 2; October 13 to November 11. Cape Bauld, October 10, 1943.

LABRADOR NOTES OF INTEREST

1. *Gavia stellata*, RED-THROATED LOON.—Rigolet, September 24, 1940 (specimen).
2. *Fulmarus glacialis glacialis*, ATLANTIC FULMAR.—Batteau, September 21, 1940.
3. *Histrionicus histrionicus histrionicus*, EASTERN HARLEQUIN DUCK.—Square Island, July, 1940. Stuffed bird recently killed offered to me for sale.
4. *Melanitta fusca deglandi*, WHITE-WINGED SCOTER.—Rigolet, September 21, 1940 (fifty).
5. *Melanitta perspicillata*, SURF SCOTER.—Lake Melville, September 15, 1940; September 21, 1940 (2000).
6. *Mergus serrator*, RED-BREASTED MERGANSER.—Lake Melville, September 16, 1940 (adults with young).
7. *Arenaria interpres*, RUDDY TURNSTONE.—Gready, August 23, 1936; Seal Islands, September 12, 1940; Batteau, September 21, 1940.
8. *Erolia fuscicollis*, WHITE-RUMPED SANDPIPER.—Indian Harbor, abundant summer resident. July 22, 1935, adults seen with young birds (I can find no record of the bird's breeding in Labrador).
9. *Crocethia alba*, SANDERLING.—Brador Bay, September 23, 1936 (Burge).
10. *Hirundo rustica erythrogaster*, BARN SWALLOW.—Indian Harbor. One record, August 23, 1935.
11. *Loxia leucoptera leucoptera*, WHITE-WINGED CROSSBILL.—Indian Harbor, August 7, 1935.

Washington, D. C.

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THE PRESENT STATUS OF THE GREAT BLACK-BACKED  
GULL ON THE COAST OF MAINE<sup>1</sup>

BY ALFRED O. GROSS

Plates 12-15

SINCE the beginning of the present century great changes have taken place in the populations of the sea birds inhabiting the Maine coast. The unprecedented increase brought about by protection and other contributing factors has involved serious competition among the birds, which is requiring many readjustments. For example, islands which 25 years ago were inhabited by thriving colonies of terns have since been completely taken over by Herring Gulls and today are now being encroached upon by the Black-backed Gulls.

Not only have these increases affected the interrelations of the birds

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<sup>1</sup> Contribution no. 13, Bowdoin Scientific Station, Kent Island, Bay of Fundy, New Brunswick, Canada.

but some of them concern the direct interests of man. For instance, the Double-crested Cormorant was completely extirpated as a breeding bird on our coast in 1900, but by 1930 it had again established itself. Today it has extended its range as far as the coast of Massachusetts and has increased its numbers to such an extent that demands are being made, chiefly by representatives of the fishing industry, that effective control measures be instituted. Cf. Gross (1943 and 1944).

The American Eider, which was reduced to the low ebb of two nesting birds in 1907, has also made a remarkable recovery and today is well established as a nesting species as far southwest as Mark Island in Casco Bay. Cf. Gross (1944a).

The Herring Gull, which was threatened with extermination as a nesting species on the Maine coast in 1900, today has become so abundant that the U. S. Fish and Wildlife Service has found it necessary to take active steps towards its control. Similar changes in populations are likewise true in the case of other species.

During the past four years I have had an opportunity, while serving with the U. S. Fish and Wildlife Service as a collaborator from 1941-1943 and as Biologist in 1944, to observe and record the recent changes that are taking place in the sea-bird colonies along the Maine coast.<sup>1</sup> These trips were taken each year from about May 20 to June 20 at the height of the nesting season. All of the important Herring Gull colonies between the Isles of Shoals at the New Hampshire-Maine state boundary to the Bay of Fundy were visited for the purpose of gull control. This paper will deal primarily with the present status of the Great Black-backed Gull (*Larus marinus*).

The Great Black-backed Gull is a recent addition to the nesting birds of the Maine coast although certain publications in the past have implied that it nested in this region. The vague statement of J. J. Audubon (1835) that: "None breed south of the eastern extremity of Maine" has never been considered as a definite record for the state.

G. A. Boardman (1862) in his 'Catalogue of the Birds found in the vicinity of Calais, Maine, and about the Bay of Fundy,' wrote as follows: "Resident. Not plenty. A few breed about the islands." This statement undoubtedly referred to the islands of the Grand Manan Archipelago in the Bay of Fundy and not to islands along the coast of Maine. A. E. Verrill, who edited and arranged Boardman's list of birds, quoted Boardman in his 'Catalogue of the Birds found at Norway, Oxford County, Maine' that: "A few appear to breed on islands in the Bay of Fundy." It is apparent that the statement of

<sup>1</sup> I wish to thank the officials of the U. S. Fish and Wildlife Service for the facilities and opportunities they have so freely given for this work.

their breeding on the coast of Maine by W. A. Stearns and E. Coues (1883) was based on Boardman's paper and not on new and original observations. This supposition is borne out by reports of contemporary authors. Everett Smith (1883), who was stationed at Machias in the service of the U. S. Coast Survey and who had corresponded and traveled extensively along the coast in gathering material for his 'Birds of Maine,' stated positively that no Black-backed Gulls bred on the coast of Maine. This statement was substantiated by S. F. Baird who was well acquainted with the coast as superintendent of the U. S. Fish Commission Surveys. Baird, Brewer and Ridgway (1884), in discussing the nesting distribution of this gull, mention its presence on islands in the Bay of Fundy but did not include the coast of Maine. The foregoing statements make it clear that the Great Black-backed Gulls were not breeding on islands of Maine during the latter part of the nineteenth century. [See also Norton and Allen (1931).]

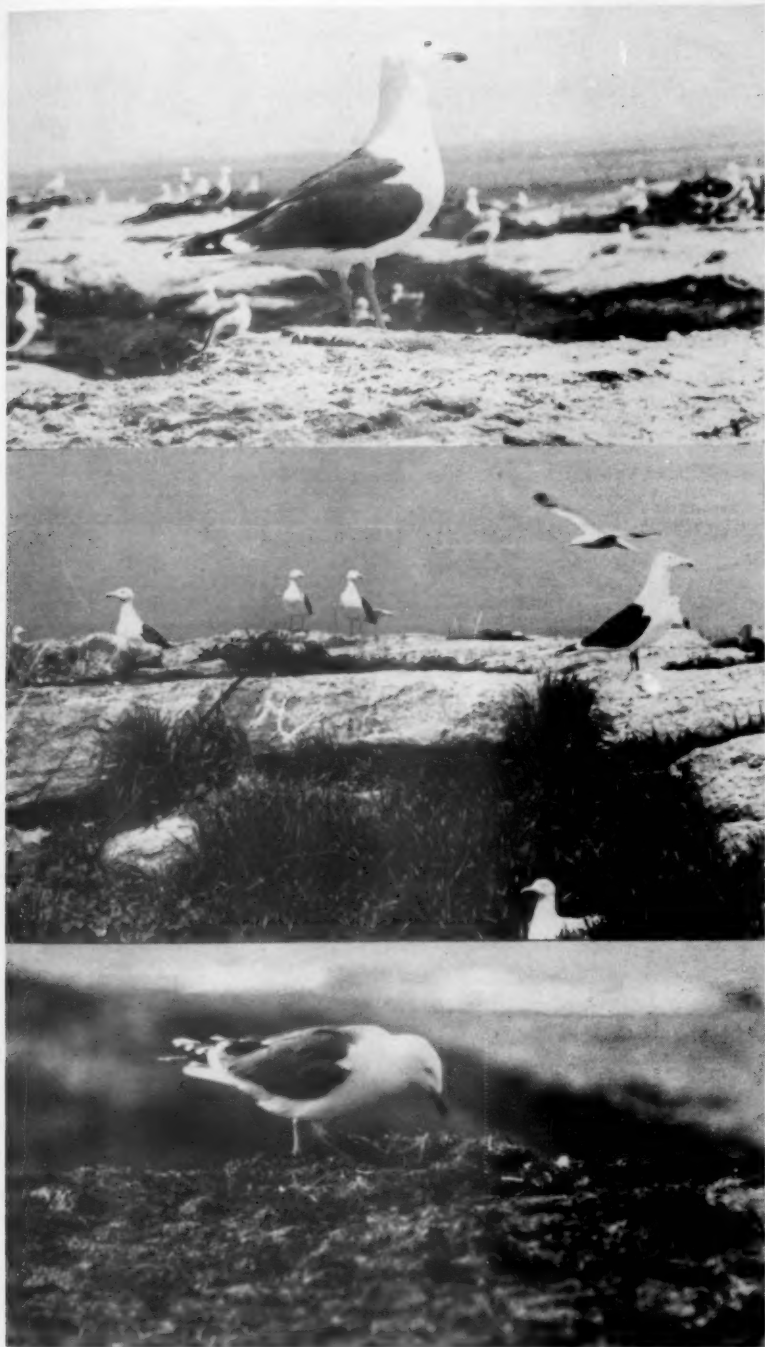
At the beginning of the present century the National Audubon Society took an active interest in protecting the sea birds of this region. From that time on, numerous observers, including William Dutcher, Arthur H. Norton, Ora Knight and others, made frequent and thorough inspections of all of the important colonies. During this period the Black-backed Gull was common as a winter resident and a few stragglers remained during the summer, but not a single pair was found breeding until the year 1928 when Jackson and Allen (1932) found three pairs nesting on Duck Island of the Isles of Shoals. [See also L. O. Shelley (1934).]

In 1931, Arthur H. Norton and Robert P. Allen (1931) made a thorough inspection of the Maine sea-bird colonies from June 23 to July 14 for the National Audubon Society. In an unpublished manuscript they reported finding the Black-backed Gull breeding on ten islands concerning which they made the following comments: "Double-shot Island, several nesting; Little Duck Island, two pairs with young; The Brothers, at least two pairs breeding; Cone Island, several nesting; Green Island off of Swan's Island, one pair nesting; Hardhead Island, one pair nesting [See also Berolzheimer (1932)]; Spoon Ledge, two nests found; Egg Rock in West Penobscot Bay, several nesting; Yellow Ridge, one pair seen, one young ready to fly; and Northern White Island, one pair of adults and one young seen." It is possible that Black-backed Gulls were breeding on some of the above islands a year or two prior to 1931 but were not observed and reported. It is of interest to note that in the same year Richard J. Eaton (1931) discovered these birds to be nesting on North Gooseberry

Island, near Salem, Massachusetts, on July 7, 1931. On July 2, 1944, F. Burnett (1944) found more than 30 young Black-backed Gulls on this island.

From this small beginning, made less than 15 years ago, the Black-backed Gull has firmly established itself as a breeding bird along the northern New England coast and has extended its range as far south and west as Cartwright Island off Long Island, New York [Arbib and Eynon (1940), Nichols (1942) and Wilcox (1944)]. It has recently been found nesting on rocks off Sakonnet Point, Rhode Island (Clement and Emerson, 1944). Today, a conservative estimate places the Great Black-backed Gull nesting population on this coast at no less than 3,500 individuals.

With only five exceptions, islands on which the Black-backed Gulls were found nesting were also inhabited by Herring Gulls. The Black-backs, on the average, start nesting about ten days or two weeks before the Herring Gulls. They thus acquire the choice nesting sites on the higher elevations and rounded knolls. The nests of the Black-backed Gulls, in addition to generally occupying the higher places, are larger, with nesting materials more widely spread, and are less deeply cupped than those of the Herring Gull. The materials are usually of grass and small weed stalks and seldom are mixed with masses of turf, soil and large sticks which so frequently are a part of the structure of the Herring Gull's nest. The eggs of the two species are similar in their color and markings but those of the Black-backed Gull average larger in size. According to A. C. Bent (1921) the average of a series of 59 Black-backed Gull eggs is  $77.9 \times 54.2$  mm. and the average of 45 Herring Gull eggs is  $72.3 \times 50.5$  mm. Although the nests and eggs of each species have certain distinctive characteristics, there are instances, especially where the nests of both are closely intermingled in a crowded colony, where I have been unable to determine the identity of the nest without seeing the incubating adult. During the last week of May we found that many of the eggs of the Black-backed Gulls had hatched whereas those of the Herring Gull were intact, with incubation of those in the most advanced stages not exceeding two weeks. Later, when downy young of both species were represented, one could distinguish the more robust, darker gray and more heavily spotted young of the Black-back from the paler and buffy young Herring Gull. The buff or yellowish-brown color is especially prominent on the tips of the down of the neck and upper breast of the latter species. The legs and feet of the Black-back young are brownish-black; those of the Herring Gull are a dusky pink in color. The juvenal and subsequent plumages of the two species are easily differentiated.



GREAT BLACK-BACKED GULL.—(*Upper fig.*) ADULT NEAR NEST ON THE HIGHEST KNOLL OF THE COLONY AT DUCK ISLAND, ISLES OF SHOALS, MAINE, MAY 24, 1944. (*Middle fig.*) FOUR ADULTS IN THE DUCK ISLAND COLONY, MAY 24, 1944. (*Lower fig.*) ADULT IN THE ACT OF DESTROYING THE THREE EGGS OF A HERRING GULL'S NEST, ST. MARY'S ISLAND, GULF OF ST. LAWRENCE, QUEBEC, JULY 7, 1931.



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Thus far I have visited 98 islands, distributed along the coast of Maine, that are inhabited by nesting Black-backed Gulls. This represents only a part of the islands occupied by these birds yet it is a fair sample which serves to indicate the present trend of the population of this species. The census of the various islands also provides a basis of comparison of the status of these birds in the past as well as what it may be in the future. Of the 98 islands, there were 47 with one to five pairs, 23 with six to ten pairs, 13 with eleven to twenty pairs and 15 islands with more than twenty pairs of breeding birds. In the group of 47 islands supporting only one to five pairs there was a total of 289 adults and a proportionate number of nests counted, an average of about six birds or three pairs breeding on each of the islands. These 47 islands present conditions which in the past have been considered typical, that is with only one or a few pairs occupying any one island, but as the Black-backed Gulls have increased on our coast more and more of them have tended to concentrate on the established nesting places. Today, some of these islands have so many nesting birds—in one case 150 pairs—that we can think of them as Black-backed Gull colonies. The habit of concentrating to form large colonies is also true in regions within the long-established nesting range of the species. H. Lewis (1942), in a census of the bird islands along the north shore of the Gulf of St. Lawrence, reported a population of 1,134 Great Black-backed Gulls on Mecatina Island. On July 3, 1934, I found 800 pairs (1600 individuals) nesting on the Gannett Islands off the Newfoundland Labrador coast north of Battle Harbor Gross (1937). There is also a concentration of about 600 nesting birds on islands in Lake George, Yarmouth County, Nova Scotia.

Following is a list of 61 islands along the coast of Maine on which five or more pairs of Black-backed Gulls were found nesting. Practically all of these islands have exhibited a substantial increase in numbers during the last four years. The numbers of nesting pairs presented in the table are from the 1944 census excepting Pumpkin and Sheep and the two islands in the Casco Bay quadrangle which we were unable to visit this year. In the latter the counts of previous years are given. The islands are arranged in order, beginning with the most eastern colony on Old Man Island and thence proceeding west and south to Smutty Nose Island in the Isles of Shoals group off Portsmouth, New Hampshire, just inside the Maine-New Hampshire state boundary.

On this group of 61 islands, there are 1,154 pairs or 2,308 individuals, an average of approximately 38 nesting Black-backed Gulls to each island.

ISLANDS OF THE COAST OF MAINE ON WHICH FIVE OR MORE PAIRS OF BLACK-BACKED GULLS WERE FOUND NESTING. THE ISLANDS ARE GROUPED BY QUADRANGLES OF THE U. S. GEOLOGICAL SURVEY. FOR CONVENIENCE IN LOCATING THE ISLANDS, THE APPROXIMATE LATITUDE AND LONGITUDE OF EACH ISLAND ARE INDICATED

Quadrangle	Island	Location	Pairs nesting
Cutler	Old Man Island	44° 37.2' N., 67° 14.2' W.	35
Machias	Double Shot Islands	44° 36.3' N., 67° 16' W.	10
	Green Island	44° 33.7' N., 67° 26.6' W.	5
	The Brothers Islands	44° 33.4' N., 67° 26.3' W.	54
	Pulpit Rock	44° 33.2' N., 67° 28' W.	6
Columbia Falls	Ballast Island	44° 33.7' N., 67° 33.2' W.	5
Great Wass Island	The Ladle	44° 29' N., 67° 44.4' W.	8
	Cone Island	44° 28' N., 67° 44.3' W.	65
Bar Harbor	Schoodic Island	44° 20' N., 68° 2' W.	46
Swan Island	Little Duck Island	44° 10.4' N., 68° 14.7' W.	32
	Great Duck Island	44° 9' N., 68° 15' W.	8
	John's Island	44° 6.6' N., 68° 24.5' W.	12
Deer Island	Great Spoon Island	44° 2.5' N., 68° 33.5' W.	24
Castine	Barred Islands	44° 16' N., 68° 50' W.	13
	Colt Head Island	44° 15.6' N., 68° 50.5' W.	16
Vinalhaven	Grass Ledge	44° 13.1' N., 68° 51' W.	6
	Compass Island	44° 12.9' N., 68° 52' W.	18
	Sloop Island	44° 12.4' N., 68° 49' W.	10
	Spoon Island	44° 12.1' N., 68° 49.7' W.	11
	Grass Ledge	44° 11.7' N., 68° 47.8' W.	6
	Dagger Island	44° 11' N., 68° 48.3' W.	8
	Sheep Island	44° 10.8' N., 68° 47.8' W.	7
	Downfall Island	44° 10.8' N., 68° 48.4' W.	6
	Robinson Rock	44° 9.7' N., 68° 58.7' W.	24
Matinicus	No Man's Land	43° 53' N., 68° 52.2' W.	25
	Ten Pound Island	43° 52.8' N., 68° 53.2' W.	15
Rockland	Fisherman's Island	44° 2.5' N., 69° 2.4' W.	28
	Marblehead Island	44° 2.1' N., 69° 2.5' W.	5
	Otter Island	44° 1.2' N., 69° 4.3' W.	7
Tenant's Harbor	Little Green Island	43° 54.8' N., 69° 2' W.	6
	The Nubble	43° 52.4' N., 69° 7.2' W.	5
	Hog Island	43° 52.2' N., 69° 7.4' W.	16
	Metinic Green Island	43° 51.7' N., 69° 8' W.	28
	Hay Island	43° 54.5' N., 69° 14' W.	13
	The Brothers Islands	43° 54.6' N., 69° 14.4' W.	8
Monhegan	West Gunning Rocks	43° 54.5' N., 69° 15.1' W.	7
	Old Hump Ledge	43° 52.6' N., 69° 21.4' W.	18
	Western Egg Rock	43° 52.7' N., 69° 25' W.	65
	Eastern Egg Rock	43° 51.7' N., 69° 23' W.	150
	Little Egg Rock	43° 51.3' N., 69° 20.5' W.	19
	Shark Island	43° 50.7' N., 69° 21.4' W.	28
	Eastern Duck Rock	43° 46.6' N., 69° 18.6' W.	16

<i>Quadrangle</i>	<i>Island</i>	<i>Location</i>	<i>Pairs nesting</i>
Boothbay	The Hypocrites	43° 48' N., 69° 35.3' W.	5
	N. White Island	43° 47.6' N., 69° 34.5' W.	8
	Pumpkin Island	43° 45.2' N., 69° 35' W.	12
Bath	Long Ledge	43° 45.7' N., 69° 54' W.	6
	Elm Islands	43° 43.4' N., 69° 56' W.	5
Small Point	Heron Islands	43° 43.2' N., 69° 48.3' W.	55
	East Brown Cow Island	43° 42.4' N., 69° 53.4' W.	8
	Mark Island	43° 43.2' N., 69° 54' W.	5
	White Bull Island	43° 43.1' N., 69° 55.5' W.	7
	Ragged Island	43° 43.6' N., 69° 56.3' W.	18
	Cedar Ledge	43° 44.7' N., 69° 57.1' W.	5
Freeport			
	Upper Green Island	43° 46.3' N., 70° 5' W.	6
Casco Bay	Western Brown Cow Island	43° 41.7' N., 70° 4.4' W.	5
	Outer Green Island	43° 39' N., 70° 7.5' W.	10
Portland	Bluff Island	43° 30.5' N., 70° 19.2' W.	8
	Stratton Island	43° 30.3' N., 70° 18.8' W.	6
Biddeford			
	Eagle Island	43° 28.8' N., 70° 21.6' W.	5
York	Duck Island	43° 0.3' N., 70° 36.3' W.	80
	Smutty Nose Island	42° 59' N., 70° 36.3' W.	6

## EXTENSION OF THE WINTER RANGE

Before the Great Black-backed Gull invaded the New England coast as a nesting species it was a common winter resident in Maine and Massachusetts, some wintered on Long Island, New York and a few as far south as New Jersey but beyond this part of the coast it was rare and only an occasional straggler, usually an immature bird, was ever reported.

With the extension of the breeding range the winter range has likewise been extended. Reports of this extension made their appearance soon after the bird was found nesting on the New England coast 1928-1931. On January 17, 1931, T. D. Burleigh (1937) saw four Black-backed Gulls at Oregon Inlet, North Carolina; H. L. Harlee (1933) reported seeing two Black-backed Gulls on St. Helena Sound, South Carolina, on November 24, 1932; Alexander Sprunt (1935) reported another seen at Bull's Island on May 12, 1935. In correspondence just received from Mr. Sprunt, he reports that S. B. Crayton has seen these gulls occasionally near South Island. An immature bird was seen by Mr. Sprunt and Robert P. Allen at Cape Romain Refuge in Oyster Bay on January 21, 1936. In January, 1940, Mr. Sprunt states that Allan Cruickshank saw and photographed three adults on January 8; and three immatures on the 10th and one adult

and two immatures on the 18th. J. J. Murray (1933) saw an adult at Sand Bridge, Virginia, on January 19, 1933; S. A. Eliot, Jr. (1936) saw one at Merritt's Island, Florida, on February 22, 1936, and Maurice Broun (1935) reported seeing two immatures on the Florida Keys, February 4, 1935. The last constitutes the most southern record of the Black-backed Gull on the Atlantic seaboard up to this time. These representative records indicate an extension of the winter range, but what is of greater significance are the reports of Clarence Cottam of the U. S. Fish and Wildlife Service, of the regular occurrence of larger numbers in the region from Delaware south to North Carolina. In 1934 he wrote: "During the past winter (1933-34) the writer has observed this bird in Delaware, Maryland, Virginia and North Carolina in numbers that would indicate the species occurs more than casually south of Delaware Bay." On February 23, 1934, Mr. Cottam saw 17 adults, and the following day, six in Pamlico Sound, North Carolina. On February 27, ten were seen at Cape Hatteras. In 1935, Cottam reported seeing 50 of these birds in Pamlico Sound in the course of five days, and 30 were seen in the region of Cape Hatteras, thirteen of which were in one flock. On January 26-27, Cottam (1938) reported seeing a dozen or more at Pea Island, North Carolina. In recent correspondence received from Dr. Cottam he has included some reports from his field men. Mr. John H. Buckalew of Chincoteague, Virginia, reports that, during a period of 16 years, he has recorded the Black-backed Gull as a regular visitor. The largest number seen during one day was 17. Of all the birds observed he estimated that 75 per cent were adults and only 25 per cent were immature birds. Mr. S. A. Walker of Manteo, North Carolina, writes that during the winter months he has found Black-backed Gulls along the entire coast line. The first fall arrivals, according to Mr. Walker, are usually seen during the latter part of September. During January and February they are present in sufficient numbers to be considered common visitors. Most of the adults are gone from the coast of North Carolina by April 10, but immature birds may be seen during the month of May. These reports are evidence of a normal extension of the winter range of the Black-backed Gull as far south as North Carolina which is correlated in time with the extension of the nesting range along the New England coast.

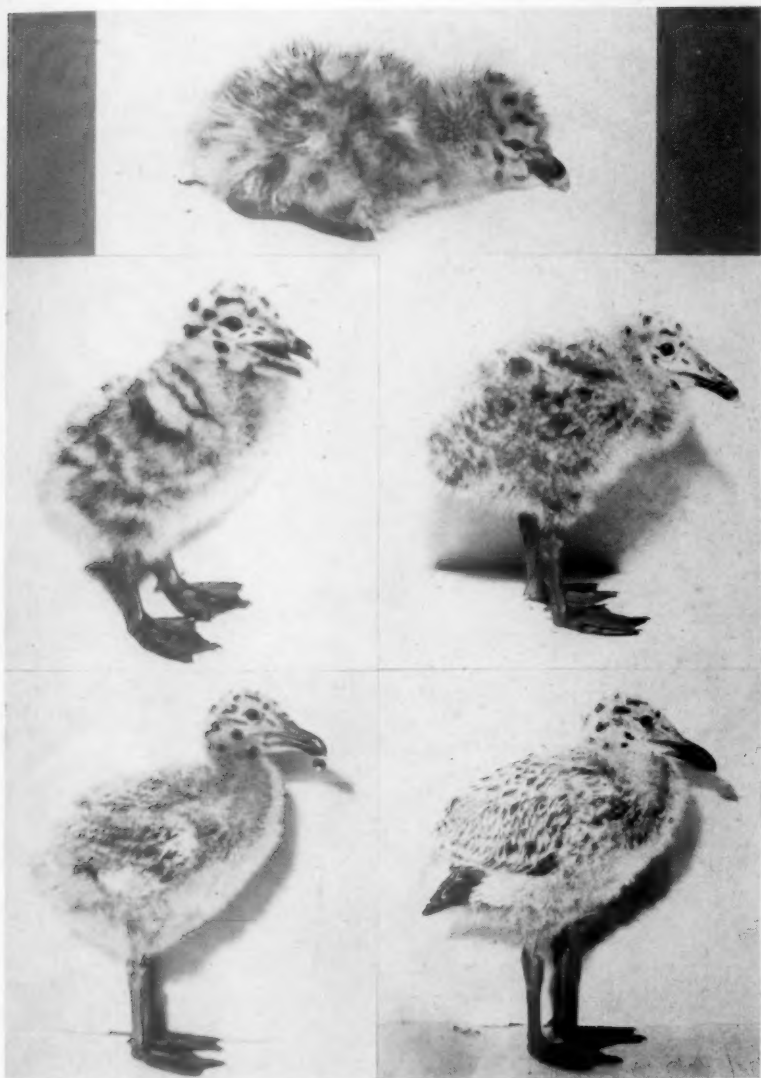
It is also interesting to note that recent dates of first appearances in the autumn are earlier than those reported prior to 1930. In times past the Black-backed Gull was not seen on the coast of New Jersey until November, but according to Cottam (1936a) the first arrivals now appear the last week of September. In the same year Cottam







GREAT BLACK-BACKED GULL.—(*Upper fig.*) TYPICAL NEST AND THREE EGGS; KENT ISLAND, NEW BRUNSWICK, JUNE 10, 1936. (*Middle fig.*) NEST AND THREE EGGS—ONE EGG PIPPED; SHARK ISLAND, JUNE 1, 1944. (*Lower fig.*) NEST CONTAINING THREE YOUNG ABOUT ONE DAY OLD; WESTERN EGG ROCK, MAINE, MAY 31, 1944.



GREAT BLACK-BACKED GULL, KENT ISLAND, NEW BRUNSWICK.—(*Upper fig.*) YOUNG ONE HOUR OLD; JUNE, 1936. (*Middle left*) TWO DAYS OLD; JUNE, 1936. (*Middle right*) SIX DAYS OLD; JULY 15, 1935. (*Lower left*) TEN DAYS OLD. (*Lower right*) TWO WEEKS OLD.

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(1936b) received reports of very early occurrences of this bird in Rhode Island. One adult was seen as early as August 5, 1935, at Cranston, Rhode Island, two were seen on September 5, and on September 15 a flock of 12 appeared. One was reported at Mastic, Long Island, on September 2. Because these early arrivals have occurred since the Black-backed Gull has extended its range to New England, it is probable that they are of birds which inhabit this region in the summer. This view receives some support by banding operations. For example, an individual banded by J. M. Cadbury in Muscongus Bay, Maine, on July 6, 1941, was recovered at Provincetown on September 15, 1941. Another bird banded at Eastern Egg Rock, Maine on July 18, 1939, was recovered as a three-year-old individual at Narragansett, Rhode Island, early in September, 1942.

In the past five years the number of wintering birds has greatly increased. Ludlow Griscom and other observers have frequently reported flocks of adult Black-backed Gulls, numbering from 50 to 250 individuals, on the Massachusetts coast. At Long Beach, New Jersey, J. K. Potter (1941) and Brimley and Grey (1941) reported seeing a flock of 100 individuals on November 10, 1940. Numerous other recent records indicate the same general trend. In addition to a larger number of breeding individuals on Massachusetts coastal islands there has also been an increase in the number of non-breeding birds seen during the summer months.

#### MIGRATION

The migratory instinct of the Black-backed Gull is not as highly developed as that of the Herring Gull. This is clearly indicated in a comparison of the recoveries of banded individuals of the two species. Many Herring Gulls banded at Kent Island and in the Great Lakes region were found to travel distances of 1,000 to 1,500 miles and a considerable number of them exceed a distance of 2,000 miles from the place of banding (Gross, 1940). The Black-backed Gull has been banded in smaller numbers, but we have 134 recoveries<sup>1</sup> which are sufficient to indicate that the distances flown during the migratory flight are comparatively limited. There are 58 recoveries of Black-backed Gulls banded on various islands along the north shore of the Gulf of Saint Lawrence, Saguenay County, Quebec, most of which were banded by Dr. Harrison Lewis and a few by Robert Johnson and others. Of these 58 recoveries, 35 were from Newfoundland, ten from the same

<sup>1</sup> Many of these have been published in the Official Record of Bird-Banding Returns in various issues of the Canadian Field-Naturalist and others were furnished by Frederick C. Lincoln in charge of Migratory Bird Investigations, U. S. Fish and Wildlife Service.



general region in which they were banded, three from the coast of Labrador, one from the Magdalene Islands, two from Prince Edward Island, four from Nova Scotia, and three from New Brunswick. Of three recoveries of birds banded on the coast of Newfoundland Labrador by Dr. Oliver Austin, two were from Newfoundland and one from Prince Edward Island. All the recoveries of these birds banded at long-established northern colonies were well within a 500-mile radius from the place of banding. It will be noted that none of the 61 birds migrated to the United States but all wintered in the Maritime Provinces and Newfoundland.

Going south to Lake George, Yarmouth County, in southern Nova Scotia, we have 60 recoveries of birds banded by R. W. Tufts, Basil Colbran, and others. Of these, 46 were recovered in Nova Scotia, one was captured at sea southeast of Nova Scotia, four were from New Brunswick, four from Maine, and five from Massachusetts. It is interesting to note that nine of the recoveries are from New England yet all are from points less than 300 miles from the place of banding. A bird banded at Kent Island, Bay of Fundy, New Brunswick, was taken at Lubec, Maine. On the coast of Maine there are records of 11 recoveries of Black-backed Gulls banded on various islands in Muscongus Bay by Joseph Cadbury, of which three were recovered in Maine, five in Massachusetts, two in Rhode Island, and one in New Jersey. One immature which I banded on Ragged Island was recovered at Bayonne, New Jersey. These records all indicate that the migratory flight of the Black-backed Gull is a comparatively short one and that the bulk of the individuals do not travel more than a few hundred miles. Gulls nesting on the coast of Labrador and the north shore of the Gulf of Saint Lawrence, Province of Quebec, do not migrate as far as the United States. Birds nesting in Nova Scotia winter chiefly from the Bay of Fundy to points along the New England coast. Birds nesting on the New England coast winter a correspondingly greater distance to the southward.

The extension of the winter range to points on the Atlantic coast south of New Jersey coincides in time to the extension of the breeding range to the New England coast. If the breeding range of the Black-backed Gull is extended as much in the next 15 years as it has been in the past 15 years we can reasonably expect the species to become a regular winter resident as far south as Florida and the Gulf Coast.

#### DESTRUCTIVE HABITS OF THE BLACK-BACKED GULL

This large gull is an aggressive and destructive bird in its relation to other species which share the same nesting islands. As it extends

its range and becomes more abundant on our coast, its depredations, especially on the eggs and young, becomes a serious menace to birds such as the eider ducks. Even one or two pairs of Black-backed Gulls nesting in the midst of a populous colony of eiders may destroy a large percentage of the eggs in the course of the nesting season. Not only are the eggs punctured and eaten, but I have seen adult Black-backed Gulls attack and kill the young ducklings. At Kent Island, from a blind placed in the midst of the colony, I saw a Black-back, in the course of a few minutes, kill three ten-day-old Herring Gulls that had unwittingly wandered into its nesting territory, by viciously pecking the heads and backs of the defenseless youngsters. I have also seen them attack and kill young eiders that were swimming in the water.

The tendency of the Black-backed Gulls to molest and plunder is not peculiar to individuals that have invaded this coast but apparently is a habit of long standing, more or less general in other parts of its range. M. Abbott Frazar (1887) during the course of the summer of 1884 spent on Canadian Labrador, made the following observations of the Black-backed Gull: "During the breeding season they feed very largely upon the eggs of other birds, and upon young Eider Ducks. They will take a Murre egg, grasp it in the center with their bill, and without breaking the two ends apart, they will crush in their sides and secure the contents. They must do it skillfully, as I never saw any part of an egg spilt on the rocks, nor did I ever see a gull's plumage stained with it either. They catch young Eiders in this way; two or three gulls will hover over a brood in the water, which of course confuses the mother duck and scatters the brood in all directions. Then by following the ducklings after each dive they would soon tire them out, and a skillfully directed blow at the base of the skull, which seldom missed its aim, would in an instant finish the business, and before the unhappy duck would know which way to turn, its brood would be one less."

Johan Beetz (1916) who resided for twenty years at Piashte Bay, mid-way between Esquimaux Point and Natashquan and who was a keen observer and made many collections and interesting observations of the birds of the region, has the following to say concerning the habits of this gull: "The greatest destroyer of the Eider is without doubt *Larus marinus*, which during the years when there are not enough little fish to feed its young, kills with ease all the young Eiders that it finds. Flying at a great height this gull sees its prey from afar, and as the young Eider (up to ten days of age) dives but a short distance, by sailing just above the water the gull is able to watch it constantly, and follow it, until, when the young is so fatigued that

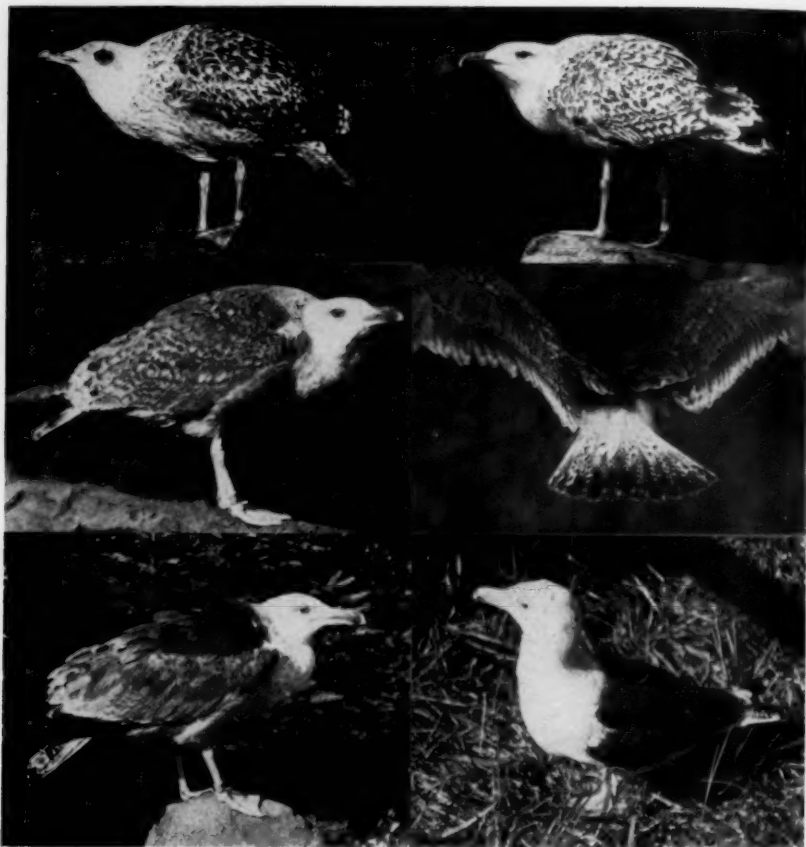
it is unable to dive more, the gull seizes it with its powerful beak. If during the journey to the nest, the young still struggles in the beak, the gull carries the duckling to a height of 30 or 40 rods, and, calculating the strength of the wind, drops it on the rocks where it is killed. The gull immediately follows and picks up the dead body."

In recent years the birds nesting along the north shore of the Gulf of Saint Lawrence have been protected by laws enforced by the Canadian Government. As a result the Black-backed Gulls, as well as other species, have increased their numbers. Dr. Harrison Lewis, Chief Federal Migratory Bird Officer who has charge of this region, stated the following in his report of 1942: "The Great Black-backed Gull, *Larus marinus* which consumes eggs and young of other birds, particularly the Southern Eider, has indeed become so numerous in this region as to be unduly destructive, with the result that it has become necessary to institute special means of control."

The Black-backed Gull does not limit its destruction to the eggs and young but has also been found guilty of successfully attacking and killing adult healthy birds. Since this aspect of the destructive habits of this species is not generally or fully appreciated, it is deemed desirable to call attention to a number of detailed observations by competent observers. Mr. J. D. Cleghorn (1942) observed one of these gulls kill an American Golden-eye at Ile au Heron Bird Sanctuary, Montreal, Canada, on October 19, 1941. He writes as follows: "The gull was chasing a female Goldeneye (*Glaucionetta clangula americana*) with the obvious intent of capturing her. The pursuit continued for approximately ten minutes, with the duck using every means to avoid being caught, except that of flight. As she broke the surface after a short dive, the gull seized her by the tail and held on with great tenacity, despite the fact that by this time she was rapidly beating her wings and had partially risen from the water. What immediately followed is pure conjecture, because the gull turned and faced in the opposite direction, holding its wings extended above its body; but we could see that it had pulled the duck under water, had transferred its hold from tail to neck, midway between the head and body, and was killing it by shaking it from side to side and plunging it under water. Then it released its grip, turned the duck over on its back, ripped it open, and for the next half hour gorged itself. Two hours later we saw an immature gull of the same species kill a duck, but because of the great distance we were unable to identify the victim nor to observe clearly the method the gull was using, but the result was the same."

Richard G. Kuerzi (1937) writes of a spectacle he witnessed with





GREAT BLACK-BACKED GULL; HATCHED AT KENT ISLAND, JUNE 28, 1935.—(*Upper left*) FIVE MONTHS OLD; NOV. 21, 1935. (*Upper right*) TEN MONTHS OLD; APRIL 14, 1936. (*Middle left*) ONE YEAR, SIX MONTHS OLD; DEC. 8, 1936. (*Middle right*) ONE YEAR, SIX MONTHS OLD (TO SHOW TAIL MARKINGS); DEC. 8, 1936. (*Lower left*) TWO YEARS, FOUR MONTHS OLD; OCT. 12, 1937. (*Lower right*) THREE YEARS OLD; JULY 6, 1938.



Allen Thomas and Hobart van Deusen of a Great Black-backed Gull killing and eating an adult male Red-breasted Merganser off Tod's Neck, Connecticut, on January 1, 1936. His account in part is as follows: "The combat took place about a quarter of a mile off shore. The Sound was very calm, and with the use of a 60 power telescope, a fairly accurate observation was obtained. The few scattered flocks of scoters, goldeneyes, and sheldrake had been checked over, when a scream of a Black-backed Gull drew our attention to a flock of mergansers, at which the gull was diving. A struggle ensued, a general commotion among the flock, which took wing, leaving two birds beating and flapping their wings. With the binoculars it became evident that the gull had a firm grip on the duck, which was making frantic efforts to get away by flying rather than diving. Within perhaps less than a half-minute the merganser's wing flapping was becoming much slower, the grip of the gull was apparently paralyzing in some way. By the time the telescope was trained on the pair the paralysis was almost complete. Very shortly the gull released its grip on the back, and the duck remained motionless. Next the gull administered three or four powerful, and vicious blows with its beak on the sheldrake's neck and head, which dropped perceptively. A few more vicious pecks by the gull concluded the kill. The body of the duck floated belly up with the head submerged, and the killer vigorously began tearing at the entrails."

Mr. C. E. Addy, Wildlife Technician of the Massachusetts Department of Conservation, has published his observations of the habits of the Black-backed Gull made at Newburyport, Massachusetts (*see* Addy, 1945). Mr. Addy reports numerous instances in which these gulls have molested adult Black Ducks and of Black-backed Gulls feeding on ducks and presents the details of one episode which are of special interest.

On several of the islands I have visited along the Maine coast, remains of eiders were found which apparently were killed and partially eaten by the Black-backed Gulls inhabiting the same islands. At Grass Ledge in upper Penobscot Bay, on June 4, 1944, we found a destroyed eider's nest and leading away from the nesting site was a great mass of eider feathers, indicating a violent struggle on the part of the victim. A few Black-backed Gull feathers indicated the probable identity of the aggressor. About 35 feet from the nest were the remains of the partially eaten eider.

The above and many similar reports serve as a serious indictment against the character of the Black-backed Gull. A species that extends its former nesting range, as this bird has done to the New

England coast, is in the same category as an introduced species that flourishes under new environmental conditions until natural checks serve to control its numbers. By protection, man has given an impetus to all of our sea birds but some of them, like the Black-backed Gull, are increasing their numbers at the expense of other species such as the Eider Duck. For this reason control of the Black-backed Gull has been advocated. However, it is important to note that both of the above species have made a phenomenal increase on our coast and it becomes a debatable question of how much control should be administered until we clearly understand the interrelations of all of the species involved while their populations become adjusted and stabilized under new conditions created by man. In cases where the Black-backed Gull is nesting on small islands crowded with nesting eiders and especially where the destruction of the eggs and young, and also of the adults, is known to be excessive, an immediate control of these gulls is amply justified.

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## THE HISTORY OF BIRD BANDING

BY HAROLD B. WOOD

BIRDS have been used by man to carry messages since very ancient times. Quintus Fabius Pictor, who was born about 254 B. C., recorded in his 'Annals' that "When a Roman garrison was besieged by the Ligurians a swallow taken from her nestlings was brought to him for him to indicate by knots made on a thread tied to its foot how many days later help would arrive and a sortie must be made." That siege occurred during the Second Punic War, 218-201 B. C. This is probably the earliest recorded instance of the marking of birds to carry a message. Pliny in his 'Natural History' completed in 77 A. D., further declared: "Pigeons have acted as go-betweens in important affairs, when at the siege [by Mark Anthony, 44 B. C.] of Modena, Decimus Brutus sent to the consul's camp dispatches tied to their feet." And later: "A man of knightly rank at Volterra, who owned a racing-in-hand [chariot] used to catch swallows and take them with him to Rome [135 miles distant southeast] and dispatch them to take the news of a win to his friends, as they returned to the same nest; they had the winning colors painted on them." Taurosthenes, by means of a pigeon, sent to his father on the isle of Ægina the news of

his Olympic victory; also the news of the death of Orillo was carried from Damiata in Greece to Egypt by a pigeon. During the Crusades, as at the siege of Jerusalem and during the crusade of St. Louis, pigeons were made useful in the service of war in a similar manner.

Marco Polo, who travelled in Asia between 1275 and 1295, in writing on falconry, stated (according to Boni, 1845): "Each bird belonging to the sovereign and the Barons has a tablet of silver on its feet, with its name and that of the owner inscribed so that wherever caught it can be returned to him." Thomas Nuttall in 1840 wrote: "A Canary Falcon sent to the Duke of Lerma, returned in 16 hours from Andalusia to the island of Teneriffe, a distance of 750 miles." This suggests that this particular bird must have carried an identifying mark. No dates were given, but the best-known Duke of Lerma lived from 1552 to 1625.

The use of metal bird bands dates back at least to the sixteenth century, if not much before. John Bachman, in an address before the Literary and Philosophical Society of Charleston, S. C., March 15, 1833, said: "The story of the falcon of Henry II is well known, which pursuing with eagerness one of the small species of bustards at Fontainebleau, was taken the following day at Malta, and recognized by the band which she bore." The distance flown was 1350 miles. William Smiley, in 1838, wrote: "A falcon which belonged to Henry IV of France escaped from Fontainebleau and in 24 hours was found in Malta." Robert Mundie, in 1878, referred to the same Peregrine Falcon as a bird belonging to Henry IV of France. Henry II of France reigned from 1547 to 1559 and Henry IV from 1589 to 1610. Since Fontainebleau received its first extensive development by Henry IV of France, who was fond of sporting events, it is likely that he, rather than the more war-minded Henry II, was this early bird bander. The development of the forest began in 1598. Bachman also referred to "a Bluebird that was so marked as to be known, built its nest for ten successive years, in a box that had been prepared for the purple martin." This undated observation may be the earliest report of an annual record of returns of a marked bird. J. D. LaFleur wrote: "History tells of a Falcon caught in the Southern Ocean in 1772 which carried around its neck a parchment bearing the inscription 'Jacob 1610'." That message may never be deciphered.

Clarence S. Jung, referring to early banding operations, cited John George Keysler's 'Travels' published in 1760, which describes the taking of a Common Heron in 1728, having on its leg a silver band with the engraved name of Duke Ferdinand, grandfather of the then present elector, showing that the bird had carried the band over 60



years. This bird was therefore banded in 1669 or before. Gilbert White wrote: "As some people were shooting in the parish of Trotten, in the County of Sussex, they killed a duck in that dreadful winter of 1708-9, with a silver collar about its neck on which were engraven the Arms of the King of Denmark." Sir William Jardine reported having heard of a like anecdote of a swan.

Frederick C. Lincoln related the incident of the Great Gray Heron, said to have been captured in Germany in 1710, bearing several rings, one of which apparently had been attached several years previously in Turkey. In 1729, at Starenberg Palace, nine miles from Munich, an account translated by C. S. Jung, says: "The court caught herons for diversion. At the end of the season a heron was released with a silver ring on the foot, the name of the reigning elector engraved thereon." Benjamin White, as quoted by Jung, wrote in 1776: "A recent instance of one [Common Heron, *Ardea cinerea cinerea*] that was taken in Holland by a hawk belonging to the Stadtholder, the bird having a silver plate fastened to one leg, with an inscription importing it had been before struck by the elector of Cologne's hawks in 1735." Oliver Goldsmith in his 'Animated Nature' also referred to this same experience, stating it was captured "35 years after being banded"—which indicates that it was caught in 1770. Count de Buffon, in 1798, also referred to the same incident, as did Bigland in 1828, and Thomas Pennant, as related by Jung.

"In 1763," M. Fontaine reported, as quoted by Bigland, "a buzzard was brought to me . . . After some time I fastened a small bell to its talons, and also attached on its breast a bit of copper with my name engraved on it. I then gave it entire liberty"—but this bird became tame and remained locally. Jung refers to a falcon in the shire of Angus, Scotland, which eloped from its master with two heavy bells on each foot on September 24, 1772, and was killed two days later in Flintshire.

Wendell F. Fogg cited a note by the Reverend Richard Polwhele, published in 1796, relating how the Third Earl of Oxford, George Walpole had his hawks capture a heron unharmed on which he placed a gold ring engraved "E. Oxford" and the date. The emperor captured the bird ten years later and sent the ring to the Earl. Since the Earl succeeded to the title in March, 1751, and died in 1791, with many years of mental unbalance, it is believed that the bird was banded between 1773 and 1781. Fogg also reported: "A heron captured in 1844 bore a band dated fifteen years before," or in 1829. William Yarrell, in 1843, recorded: "Several swifts, indelibly marked, returned not only for three years in succession, but one of their number

was caught in the same locality at the expiration of seven years." Landsborough Thomson wrote that J. Schenk brought to light three records of marked storks which are believed to have journeyed from Europe to India, one of which dated from 1813, another 1884. These early activities cannot be regarded as made with any intention of scientific investigation, interesting as they are individually.

In Europe, systematic bird banding was first suggested in 1866 by C. Millet who wrote: "A scheme is proposed for marking migrant birds by differently colored threads, whereby their movements may be more certainly determined." J. A. Palmén of Helsingfors, however, in an address before the 2nd International Ornithological Congress in Budapest in 1892, during a discussion of the problems of migration, declared skeptically: "A model procedure for the investigation of the individual species cannot be prescribed. It is rather to be expected that each inquirer will learn something from the practical methods of the others." Although his plea was for a concerted coöperation among bird students, he had no vision of the capture and marking of individual birds. Even Whitlock, in 1897, questioned whether it is possible to prove that any species of bird in central Germany migrates to the southern parts of Africa to winter there.

Systematic bird banding was begun in Europe in 1899 by Christian Mortensen, first with Starlings, later with storks, ducks and larger birds of prey. He received so many interesting returns from his banded birds that it stimulated others in Europe. Thienemann, at the October, 1900, meeting of the German Ornithological Society, suggested that a bird station be founded at Rossitten in East Prussia. The station was opened January 1, 1901, but Thienemann did not begin banding work until 1903. In 1904, Tomlinson began marking Starlings near Edinburgh, and Gurney banded young Gannets on Bass Rock in the Firth-of-Forth with rings marked "Bass Rock 1904." In 1905, Hamilton, at Baron's Court, County Tyrone, Ireland, marked Woodcock with rings inscribed "B. C." Ardilaun, at Cong, County Galway, used rings marked "A. Cong" and Graham had "R. G." on his bands. Banding was started in Hungary in 1908, in France in 1909, and this same year it was propounded in 'British Birds' and started on a large scale in England.

In America, Audubon is usually acknowledged as the first bird bander, having begun this activity in Pennsylvania. While living along the Perkiomen Creek, near Philadelphia, about 1803, he wrote of a nest of young Phoebe: "When they were about to leave the nest, I fixed a light silver thread to the leg of each, loose enough not to hurt the part, but so fastened that no exertions of theirs could remove it.

. . . At the next year's season when the Pewee returns to Pennsylvania I had the satisfaction to observe those in the cave and about it. Having caught several of these birds on the nest, I had the pleasure of finding two of them had the little ring on the leg."

Leon J. Cole deserves the honor of having introduced scientific, systematic bird banding to America when he stated, in an address before the meeting of the Michigan Academy of Science held March 28-30, 1901: "In order to get information on the movements of fish, the United States Fish Commission fastened numbered tags upon individuals that have been caught and let them go again. It is possible such a plan might be used in following the movements of individual birds, if some way could be devised of numbering them which would not interfere with the bird in any way and would still be conspicuous enough to attract the attention of any person who might chance to shoot or capture it." Cole made these remarks without knowing anything of the individual attempts of Audubon or of the others in Europe. At the Cambridge meeting of the American Ornithologists' Union, November 18, 1908, Cole read a paper on "The Tagging of Wild Birds as a Means of Studying their Movements." He had been instrumental in having this work taken up by the New Haven (Conn.) Bird Club the previous winter, but by this time Bartsch and Taverner, and some others, had already begun their activities in banding.

Dr. Paul Bartsch of the Smithsonian Institution, in June, 1902, visited colonies of Black-crowned Night Herons near Washington and banded 23 with bands inscribed "Return to Smithsonian Institution" with the year and a number. He obtained a report of one of these herons shot September 24, 1902, at Abington, Maryland, 55 miles from the place of banding. From 75 others banded in 1903 came a report of one found dead in Cuba two years later—the first long-distance record of a bird banded in America. This work by Bartsch was actually the first scientific use of numbered bands in America.

P. A. Taverner was the person who initiated the distribution of bird bands, by furnishing some 200 hand-made aluminum bands to his correspondents. Taverner, then of Ann Arbor, at a meeting of the Michigan Ornithological Club at Ann Arbor, April 2, 1904, proposed his plan to attach aluminum bands to the legs of birds "with the hopes that they might be found by ornithologists." Taverner had a vision of the scientific advantages of banding in that, as he said, "exact data on the ages of different plumages, length of life of birds, individual routes of migration and the distances travelled by individuals, are but some of the problems that must be attacked," and he offered to supply the bands. His bands were marked: "Notify the

Auk, N. Y." with a serial number. From them came the second long-distance record—a young Flicker banded May 29, 1905, at Keota, Iowa, taken December 25, 1905, in Sabine County, Louisiana.

Thus, individual banding operations grew apace, with the identity of some early banders still unknown. In 1907, according to Henry Oldys, a Canvasback was killed on October 25 at Manahawkin, New Jersey, with a band marked "T. J. O. D. 48," and in November, a Redhead Duck, banded "TJOD 49" was shot at Beach Haven, N. J., as reported by Seymour Woodruff. How many other privately marked bands have been used is unknown. Albin F. Mattson banded a Marsh Hawk in 1927 with a band inscribed "A. F. M. Cokato, Minn." F. W. Rapp of Vicksburg, Michigan, caught a Coot with a poultry band around its neck with the number 30 stamped in front and the name "Afton Reed" scratched in the back. Other personal bands have doubtless been used but never systematically registered with a central office which could assist in completing records, such as those recently marked "R. S. Baker, 5 Bain, Toronto." Other messages follow the methods of the notes placed in bottles and cast overboard. A Duck Hawk was found at Cape Canaveral, near Palm Beach, Florida, December 10, 1888, with a tin cap-box attached to its neck by a wire and bearing a message within dated October 10, 1888. The bird had been released from the Frying Pan Shoals Lightship off Cape Fear, slightly less than 200 miles from the place where it was found. Similar records deserve publication.

The late Jack Miner is regarded as the pioneer bander of America, considering the amount of his work and the extent of his reports of returns from distant localities. He established his sanctuary for ducks and geese near Kingsville, Ontario, Canada, in 1904, and tagged his first duck, a Mallard, in August, 1909. That individual duck was shot at Anderson, North Carolina, in January, 1910. This is the first complete flight record of a banded duck. In the spring of 1939, Jack Miner tagged his 20,000th Canada Goose.

Dr. John B. Watson began his work in 1909 with Noddy and Sooty Terns at the Tortugas Reservation, Florida, using paint for marking the birds. The birds were shipped to Galveston, Texas, or to Cape Hatteras, North Carolina—air distances of 1200 and 800 miles, respectively—and some returned thence to their nests. This is the first 'homing' experiment recorded in America.

The next step in the development of bird banding was organizational. Bird banding as a scientific study was introduced to the American Ornithologists' Union at the Cambridge meeting in November, 1908. The following year, on the evening of December 8, 1909,



the A. O. U., assembled in New York, organized the American Bird Banding Association, with Leon J. Cole as president and with 34 charter members. After inquiries among six different European organizations, the style of band recommended by 'Country Life' of London was adopted, and 7500 bands of eight sizes were ordered. They bore a serial number with "Notify Am. Museum, N. Y." or "Notify A. M., N. Y." or "Notify the Auk, N. Y." That year, 4173 bands were distributed among 44 persons, and 800 were used on 73 species of birds. During the early years, most of the banding energy was expended upon fledglings in which there was a high mortality and the number of returns were relatively few.

The New Haven Bird Club had begun banding operations during the winter of 1907-1908, using bands marked "Box 2, Yale Sta. New Haven, Conn." The banding committee consisted of Dr. Louis B. Bishop, Leon J. Cole and Clifford H. Pangborn. On October 27, 1908, Dr. Bishop reported to the Linnaean Society of New York on the work inaugurated in New Haven and the banding of nestlings that year, and suggested that Linnaean members coöperate. Dr. Jonathan Dwight, Jr., pointed out the valuable information relative to the course and extent of travel of individual birds which an extended adoption of tagging work would probably open to ornithological science. On November 22, 1910, Dr. Francis Harper reported on his banding of Spotted Sandpipers on Four Brothers Island. Interest thus was aroused among individuals, but the Society took no action until the autumn of 1911 when it offered to foster the work of the young American Bird Banding Association.

The New England Bird Banding Association was organized on January 17, 1922, under the tireless energy of Laurence B. Fletcher, to develop a stable organization. Fletcher foresaw the advantages of concerted activity and arranged for a meeting to be held in August 1921, in the lecture room of the Boston Society of Natural History, to hear Dr. S. Prentiss Baldwin tell about bird banding. Fifty interested persons attended, and the meeting was so successful that the next spring meeting was held for organizing. E. H. Forbush was elected President and L. B. Fletcher, Secretary. The name of the association was changed in 1924 to the Northeastern Bird Banding Association. The publication 'Bird-Banding' was started in 1926.

The Inland Bird Banding Association was formed at the Chicago meeting of the A. O. U., October 24, 1922, with S. Prentiss Baldwin, President, and William J. Lyon (of Waukegan, Ill.), Secretary. The I. B. B. A. was brought about largely through the efforts of Mr. Lyon who had previously written to about 75 persons who he thought might



be interested. In March, 1922, Lyon began editing the Bird Banding Department of the *Wilson Bulletin*. In June, 1929, the I. B. B. A. began publishing the 'Inland Bird Banding News' with O. A. Stevens as Editor and Secretary.

The Eastern Bird Banding Association was organized on April 24, 1923, at a meeting of the Linnaean Society of New York held in the American Museum of Natural History. Dr. Arthur A. Allen was elected President, J. E. Webster, Secretary, and Rudyerd Boulton, Executive Secretary. The monthly publication 'EBBA NUS' ('EBBA News' after 1944) was started during 1938.

The Cooper Ornithological Club in California moved next by forming a banding chapter of the Cooper Club, which became the Western Bird Banding Association at a meeting held January 11, 1925, with J. E. Law as Chairman. The first meeting was held April 5-7, 1926, and the publication 'News from the Bird Banders' followed. Prior to the development of the W. B. B. A., some banding had been done in the west. Joseph Kittridge, Jr. began banding on May 26, 1915, near Missoula, Montana, and Mrs. Amelia S. Allen, on July 24, 1918, may have become the first bander in California. Each of these persons used bands supplied by Howard H. Cleaves, Secretary of the American Bird Banding Association, who collected the early records. The 'Condor' records show that 31 birds were banded during 1915.

Traps were first designed for catching pigeons, poultry and sparrows, exclusive of the bird-nets used previously in Europe. Specially designed traps included one of Charles W. Miller used by the Worthington Society for the Study of Bird Life at Shawnee-on-the-Delaware, and also the automatic trap designed by Charles H. Tesch of Milwaukee for catching English Sparrows. That was probably the first automatic trap. The first trap used for banding purposes was the 'Government Sparrow Trap,' formerly called the funnel trap and originally designed in 1912 by the U. S. Department of Agriculture for getting rid of the obnoxious English Sparrows. It, with the Miller and Tesch traps, was described by Ned Dearborn. Dr. S. Prentiss Baldwin, who was the originator of the plan of trapping birds for banding, began to trap English Sparrows about 1913 at Gates' Mills, Ohio. He began banding in 1914 and soon designed various forms of traps. Thus was started the development of endless ways and methods of catching birds for banding.

The Biological Survey assumed control of the bird-banding activity in the United States in 1920, after the American Bird Banding Association dissolved its organization in January, 1920, and turned its bands over to the Survey. Dr. Alexander Wetmore used the first bands

issued by the Biological Survey by banding about 1000 ducks in the Bear River marshes in Utah, from 1914 to 1916. The Survey bands were of aluminum and were marked with a serial number and "Biol. Surv." or "Bi-Surv." with or without "Notify Wash. D. C." or "Washington, D. C." In 1921 there were about 135 coöperating banders. The Biological Survey was merged with the Bureau of Fisheries to form the Fish and Wildlife Service in the U. S. Department of the Interior on June 30, 1940.

Thus bird banding has progressed until from 1920 to June 30, 1944, a total of 4,690,873 birds had been banded with reports of 331,480 later captured, shot or found. During the fiscal year ending June 30, 1944, a total of 162,418 birds of 349 species had been banded under the direction of the Fish and Wildlife Service.

By such methods bird banding was developed as an important branch of scientific investigations in biology.

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A SYSTEMATIC STUDY OF THE MAIN ARTERIES IN THE  
REGION OF THE HEART—AVES XIV  
GRUIFORMES, PART 1<sup>1</sup>

BY FRED H. GLENNY<sup>2</sup>

INTRODUCTION

As in other previous papers on this subject, the writer has presented the basic arrangement-patterns, as well as the more important family and individual variations, of the main arteries in the neck and thorax of birds, in so far as this was possible within the limitation of numbers of species and specimens of any single species and time in which to make adequate observations on any group of birds—along with the difficulties encountered in obtaining many species of birds.

The present paper is limited to a consideration of the main cervical and thoracic arteries in three species of the Gruiformes.

MATERIALS

Three specimens of *Fulica americana* and single specimens of *Grus antigone* and *Anthropoides paradisea* were dissected and diagrams of the main arteries of the neck and thorax prepared.

Specimens were made available for this study by the Division of Birds, Royal Ontario Museum of Zoology, Toronto, Canada.

OBSERVATIONS

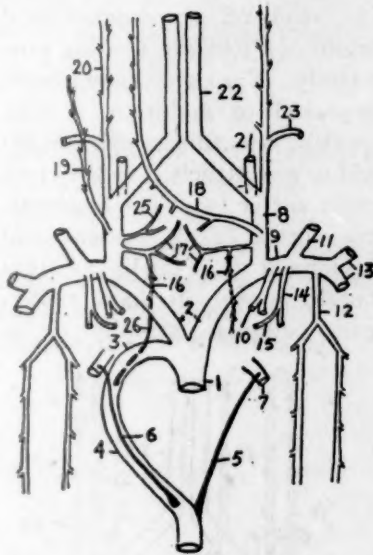
The basic ordinal pattern of the Gruiformes is characteristically "aves bicarotidinae normales" (Garrod, 1873). The right systemic arch (3) arises from the aortic root (1) at the point where the innominate arteries (2) bifurcate and pass anteriorly and diagonally to the left and right before dividing to form the common carotid (8) and subclavian (9) arteries. The subclavian artery then gives rise to the coracoid major (10), axillary (11), intercostal (12), and two pectoral (13) arteries in order. The common carotid gives rise to the ductus shawi (16), superficial cervical (20), vertebral (21), and internal carotid (trunk) (22) arteries. The accessory ascending oesophageal artery (18) arises variously from the common carotid and internal carotid arteries.

In the two species of Gruidae which were examined, the intercostal artery divides into ventral and lateral branches, whereas in *Fulica americana* only one vessel could be observed.

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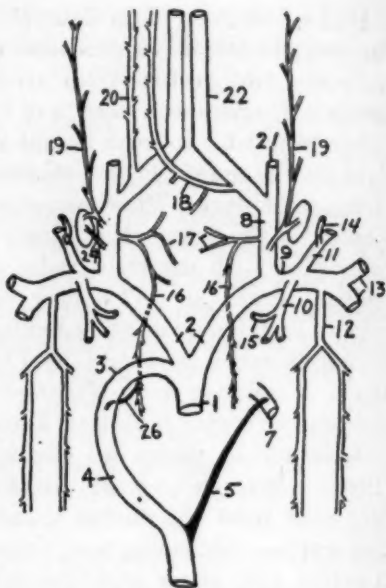
In *Grus antigone* (Text-figure 1), the subclavian artery gives rise to the coracoid major (10), coracoid minor (14), axillary (11), intercostal (12), and two pectoral (13) arteries in order. The sterno-tracheal artery (15) arises as a branch of the coracoid minor. The intercostal artery bifurcates to form lateral and ventral branches. The left and right ductus shawi (16) are short and reduced. The posterior portion of the right ductus shawi remains, in the single specimen which was studied, as the ligamentum caroticum (26) and maintains its proximal connection with the right radix aortae (4) at the base of the right systemic arch (3). This may be only an individual variation similar to that observed by Finn (1891) in *Dafila spinicauda* and *Nycticorax violaceus*, or it may indicate a family tendency as shown by Glenny (1943). Syringo-tracheal arteries (17) arise from the ductus shawi. The accessory ascending oesophageal artery (18) arises from the left common carotid artery and passes anteriorly and diagonally to the right side of the neck until it comes to lie next to the oesophagus. The right common carotid gives rise to a small accessory superficial cervical artery (19) before forming the normal superficial cervical (20), vertebral (21), and internal carotid (trunk) (22) arteries. The scapular arteries (23) arise from the superficial cervicals, of which the right vessel comes to serve as an ascending oesophageal artery. Both the ligamentum aortae (5) and right ligamentum botalli (6) are present and prominent.

TEXT-FIGURE 1.—*Grus antigone*.

In *Anthropoides paradisea* (Text-figure 2.) the subclavian artery gives rise to the coracoid major (10), axillary (11), intercostal (12), and two pectoral (13) arteries. The sterno-tracheal artery (15) arises as a branch of the coracoid major; the coracoid minor (14) is a branch of the axillary; and the intercostal (12) divides into ventral and lateral branches. The common carotids give rise to the ductus shawi (16), small accessory superficial cervical (19), vertebral (21), normal superficial cervical (20), and internal carotid (trunk) (22) arteries. The left superficial cervical artery could not be observed in the specimen



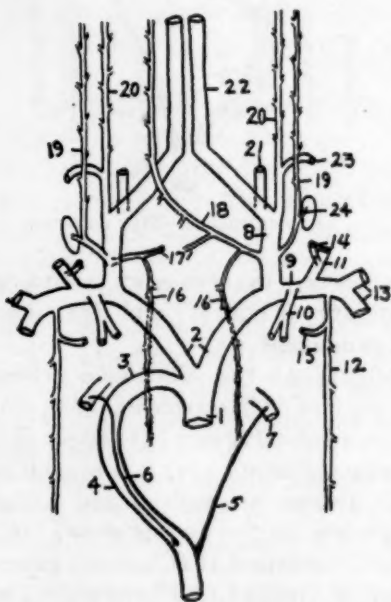
studied, while the right vessel came to serve as the primary ascending oesophageal artery. The accessory ascending oesophageal artery (18) arises as a branch of the left internal carotid (trunk). The thyroid arteries arise variously from the common carotid and accessory superficial cervical (19) arteries. The ductus shawi (16) sends off a syringotracheal branch (17) before passing posteriorly. The right ductus shawi appeared to maintain a very short ligamentum caroticum (26) which was attached to the right radix aortae (4). The ligamentum aortae (5) is present and prominent while the ligamentum botalli appears to have undergone complete atrophy or to



TEXT-FIGURE 2.—*Anthropoides paradisea*.

have fused with the right radix aortae.

In *Fulica americana* (Text-figure 3.) the coracoid major (10), axillary (11), intercostal (12), and two pectoral (13) arteries arise in order from the subclavian artery. The coracoid minor (14) arises as a branch of the axillary, while the sterno-tracheal artery (15) arises from the intercostal artery. The common carotid (8) gives rise to the ductus shawi (16) which sends off a syringotracheal branch (17), an accessory superficial cervical artery (19) which sends off a short thyroid artery (24), the superficial cervical artery (20) which gives rise to a scapular artery (23), the vertebral artery (21), and the in



TEXT-FIGURE 3.—*Fulica americana*.

ternal carotid (trunk) artery (22) in order. The accessory ascending oesophageal (18) arises as a branch of the left ductus shawi. Both the ligamentum aortae (5) and the ligamentum botalli (6) are present and prominent.

#### DISCUSSION

From the above observations, one may observe certain fundamentally common ordinal characteristics in the arterial pattern; but, at the same time, it will be noted that there are several individual variations in arrangement. The significance of these variations, however, cannot be evaluated at the present time due largely to the lack of adequate materials from which to draw conclusions and with which to make more complete comparisons.

#### ABSTRACT

Three species of birds, representing two families of Gruiformes, were dissected and diagrams of the arrangements of the main arteries in the neck and thorax prepared. Essential differences, as well as similarities, were noted. The presence of an incomplete ligamentum caroticum was noted in two species of the Gruidae. An accessory ascending oesophageal artery was found in each of the three species. The ligamentum aortae was present in each of the species included in the study.

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#### KEY TO TEXT-FIGURES

VENTRAL VIEW OF THE MAIN ARTERIES IN THE NECK AND THORAX OF: Figure 1.—*Grus antigone*. Figure 2.—*Anthropoides paradisea*. Figure 3.—*Fulica americana*.

1, Aortic root; 2, innominate arteries; 3, right systemic arch; 4, right radix aortae; 5, ligamentum aortae; 6, ligamentum botalli; 7, pulmonary artery; 8, common carotid artery; 9, subclavian artery; 10, coracoid major artery; 11, axillary artery; 12, intercostal artery; 13, pectoral arteries; 14, coracoid minor artery; 15, sterno-tracheal artery; 16, ductus shawi; 17, syngo-tracheal arteries; 18, accessory ascending oesophageal artery; 19, accessory superficial cervical artery; 20, (normal) superficial cervical artery; 21, vertebral artery; 22, internal carotid (trunk) artery; 23, scapular artery; 24, thyroid artery; 25, meso-oesophageal artery (ductus visscheri); 26, ligamentum caroticum.

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Ohio

## REACTION OF THE MOURNING DOVE TO COLORED EGGS

BY H. ELLIOTT MCCLURE

THE Mourning Dove, *Zenaidura macroura* (Linn.), has a nest fidelity which is probably not excelled by any other of our wild birds. Little can be done to the eggs or young short of actual destruction which will discourage the parents. Early in the nesting cycle, when eggs are fresh, the bird incubating during the day, usually the male, may be frightened from the nest and will remain away as long as an hour, but after incubation progresses this time shortens until the return is a matter of minutes. If one sex is frightened from the nest, often the other will be the first to take over the incubation or brooding duties. Only when the birds are flushed from the nest at night do they make no effort to return. In the process of observing nearly four thousand nests in Iowa and Nebraska over a period of five years, from 1938 to 1943, and in the handling of twelve hundred eggs and nearly two thousand young, no nest desertion that could be attributed to the observer has been noted.

Mourning Doves make but little effort to protect a nest containing eggs from predators other than by striking at the marauder with their wings. When young are in the nest, both parents will fight Blue Jays or other predators in order to save their nestlings. During exceedingly hot weather a flushed dove will quickly return to an exposed nest, such as one on the ground, in order to protect young or eggs from overheating. That the parent performs the broken-wing ruse is common knowledge.

In order to test the staying quality of the dove in this matter of nest disturbance it was decided to color eggs with various tints. Children's ordinary water colors were used and eggs of different nests in the wild were colored all hues of the rainbow.

At the time of laying, the eggs have a creamy white color with an orange tinge. The orange tinge results from the translucence of the shell which permits the yellow of the yolk to show through. As incubation progresses, this color gradually turns to a dead white. By the end of incubation the eggs are a grayish white as a result of the parents' walking over them with dirty feet. Following a rain, the eggs will be stained clay color or black depending upon the kind of mud through which the parents have walked. This accumulation of dirt is gradually rubbed off by the breast feathers, but the shell never becomes really clean again. The shell of an egg has a soft, irregular surface at the time of laying, but during incubation this is worn off so that the shell becomes shiny and smooth. Sterile eggs become almost gray as they

are further incubated. As one becomes acquainted with these normal colors of dove eggs, it is possible to tell within a day or two the length of time a nest has been active.

It was known that a dove would incubate the blue eggs of a Robin while incubating her own and not be perturbed by this additional color. Captive doves had shown fear of brilliant reds, but little is known concerning color perception in this species. It was hoped that by coloring eggs, something of the birds' color perception might be learned.

Experiments were as follows. In a low nest in an apple tree, one egg was painted yellow and the other left white. The bird did not return immediately, but later came back and continued incubating. In a nest in a hackberry, one egg was colored bright green and the other left white. When the parent returned forty minutes later, it alighted above and looked at the eggs. Then it jumped down beside the nest and examined them again. Finally it settled to incubating as though nothing were wrong. Green and yellow are not such startling colors, but surely red would appear as blood and look as though the eggs were damaged. In a nest in a lilac bush, one egg was colored blood red and the other left white. This dove returned in three minutes and incubated the eggs without hesitation. These eggs hatched, the young were banded, and a later brood was raised in the same location. In another nest in an apple tree, both eggs were painted bright robin's-egg blue. The bird returned in fifteen minutes and incubated them. In a nest in an elm tree, a very fresh egg was found and dyed black. The bird returned half an hour later and during the day laid a second egg. Only one of the two eggs hatched and this proved to be the black one. Apparently the dye itself had no effect upon the eggs.

Since the coloring of only one egg did not seem to bother the birds, another test was made by dyeing both eggs, each a different color. In a nest in a hackberry tree, one of the eggs was painted orange and one blue. The parent incubated them. In a nest in a red pine, one egg was painted bright red and the other dark green. All of these colored eggs hatched and the young were banded. At another time, a single egg was found in a nest in a small hackberry and it was colored black and yellow with a white band left in the middle. The bird did not return immediately and the egg was found, later in the day, destroyed by some other bird. In another nest, one egg was colored red, white and blue, the other brown. These also hatched. Finally, both eggs in a nest were striped yellow and black with a white band in the middle, thereby duplicating the egg that had been destroyed, and these hatched.

It seems evident from these observations that the Mourning Dove will incubate its eggs regardless of their color. Since no color nor combination of colors caused nest desertion, we have no conclusive evidence whether the bird is color blind or not. Observations of eggs in other nests determined that any sort of damage to the eggshell, such as slight cracks or even small punctures, will cause nest desertion, although this rule is not universal. In many instances a punctured or cracked egg is simply removed by the dove and the other continued to be incubated. The fact that in many cases the returning birds examined the eggs before incubating them would seem to indicate that they noticed that a change had taken place, but the desire to incubate overcame any suspicions aroused by the egg color. There is much evidence from observations of captive birds that condition of the egg is determined through touch. The breast feathers have a tactile sensitivity so that they can determine the weight and structure of the egg. A puncture in an egg is apparently noted first through the stimulus of irregularity. When a dove settles down to incubate a punctured egg, it will quickly arise and examine the egg by turning it over with its bill. If, after several attempts, the egg does not 'feel' right, it will be pushed aside or even carried away. It may be concluded that the color of a dove egg is of less importance to the bird than the structural condition.

#### SUMMARY

Eggs in Mourning Dove nests were dyed with water colors in a variety of hues. In no instance did the color or colors of the eggs interrupt incubation or inhibit hatching. The presence of punctures or breaks in the eggs produces a greater response in the bird than the color, and may interrupt or stop incubation.

*Nebraska Game, Forestation and Parks Commission*

*Upland Game Bird Survey*

*Ord, Nebraska*

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#### NOTES ON VERACRUZAN BIRDS

BY WILLIAM B. DAVIS

ORNITHOLOGICAL material from Veracruz, accumulated in 1941 and 1942 by field parties from the Department of Fish and Game, Agricultural and Mechanical College of Texas, add to the knowledge of the birds of that Mexican state. In view of the fact that little has appeared in print in the last two decades concerning the summer birds of that region, it seems appropriate to place on record the results of our work.



Camps were established at seven localities in Veracruz, as follows:

(1) North slope of Cofre de Perote, 10,500 feet, July 26 to August 4, 1942, at a sawmill locally known as Pescados. The small hamlet of Conejo was a short distance farther up the mountain. Collecting was done in the immediate vicinity of Pescados and Conejo, except for one trip to the peak. The dominant vegetation was pines, except on the bare peak. Forty-one specimens (18 species) were taken.

(2) Guadalupe Victoria, (5 km. west of Perote; Aguatepec, on some maps) 8,000 feet, July 28 to August 1, 1942, in a stubble field on a rolling, arid plain, near the village. Collecting was done within a radius of one mile. The native vegetation was largely grasses, weeds, and maguey. Seven specimens (two species) were collected.

(3) Five kilometers east of Las Vigas, 8,000 feet, August 1-8, 1942, in a lava-strewn field. Collecting was done within a radius of two miles. The terrain was mountainous; the dominant vegetation was pines. Twenty-three specimens (16 species) were collected.

(4) Five kilometers north of Jalapa, 4,500 feet, July 1-4, 1941, and July 30 to August 8, 1942, on the bank of the Río Banderillo at the San Lucas Martín settlement, about two miles below the town of Banderillo. Collecting was done within a radius of two miles. The woodland, largely of broad-leaved trees and dense thickets, was interspersed with cornfields. A pond, a marsh, and a meadow were nearby. Forty-one specimens (22 species) were collected.

(5) Puente Nacional, 500 feet, July 6-9, 1941, near the junction of a small, clear creek and the Río Antigua. Collecting was done within a radius of one mile. The vegetation was arid tropical on the uplands and tropical in the canyons and small valleys. Forty-one specimens (23 species) were taken.

(6) Plan del Río (32 km. airline southeast of Jalapa on highway to Vera Cruz) 1,000 feet, July 25-31, 1942, on a small creek that empties into the main river a short distance below the town. Activities were confined to the immediate vicinity. The vegetation was arid tropical on the uplands, but tropical (bananas, mango, etc.) along the stream. Fifty-four specimens (23 species) were collected.

(7) At sea level near the small town of Boca del Río, about five miles south of Vera Cruz. Specimens collected here will be reported upon separately in conjunction with a collection made at the same locality by a party from Cornell University.

In all, 208 specimens, representing 79 species, were collected. To be sure, this is but a fraction of the more than 600 kinds of birds recorded from the state (Loetscher, MS.), but we are able to report one hitherto unrecorded species (*Coccyzus minor continentalis*) and to

establish summer records of such birds as *Buteo jamaicensis calurus*, *Bolborhynchus lineola lineola*, *Tyto alba guatemalae*, *Tachycineta thalassina thalassina*, and *Passerina versicolor versicolor*.

Dr. George M. Sutton, Cornell University, generously made available to me a thesis by Dr. Frederick W. Loetscher, Jr., on the "Ornithology of the Mexican State of Veracruz with an annotated list of the birds," and offered many helpful suggestions. Also, I acknowledge the helpfulness of Dr. Alexander Wetmore, U. S. National Museum, in identifying specimens of *Habia* and *Chlorospingus*; of Dr. J. Van Tyne, Museum of Zoology, Ann Arbor, Michigan, in comparing specimens of *Buteo*, *Falco*, *Tyto*, *Turdus*, *Otocoris*, *Toxostoma*, *Myiochanes*, and *Empidonax*; of Dr. John W. Aldrich, U. S. Fish and Wildlife Service, in comparing all material marked with an asterisk; and of the Texas Cooperative Wildlife Research Unit, College Station, in supplying certain equipment and personnel for the 1941 field party.

#### LIST OF SPECIES

\**Butorides virescens eremonomus* Oberholser, GREEN HERON. 1 ♀, Plan del Río, 1,000 ft., July 28, 1942 (weight 184.7 grams). Green Herons were encountered several times in June and July: on the Río Axtla near Tamazunchale, San Luis Potosí; at Boca del Río, Veracruz; and at Plan del Río, Veracruz. At Plan del Río three or four were observed in a two-mile stretch of riparian vegetation along the creek. These records would seem to warrant considering the species a breeding bird in Veracruz, a status that is questioned by Loetscher (MS.). Aldrich states that our specimen is much lighter below than *virescens* and smaller and darker-necked than *anthonyi*. Our specimen and one in the Biological Survey Collection from Los Reyes, Michoacán, seem to substantiate the characters ascribed to this race. Peters (Checklist of Birds of the World, 1: 103, 1931) places it as a synonym of *anthonyi*.

\**Buteo jamaicensis calurus* Cassin, WESTERN RED-TAILED HAWK.—1 ♂, Cofre de Perote, 10,500 ft., July 27, 1942. The Red-tailed Hawk was frequently seen in the higher mountains of central Mexico where it doubtless breeds. Our Mexican specimens have been compared by Dr. Van Tyne, who states (*in litt.*) that they "seem to be straight *calurus*."

\**Falco sparverius sparverius* Linnaeus, EASTERN SPARROW HAWK.—1 ♂, Cofre de Perote, 10,500 ft., July 30, 1942 (testes small; weight 92.9 grams). The Eastern Sparrow Hawk was a common summer bird at higher elevations in southern México. Our parties observed or collected it at Monte Río Frío, Mount Popocatepetl, Pico de Orizaba, and Cofre de Perote. Dr. Van Tyne referred our specimens tentatively to the race *sparverius*. In slightly smaller size, darker coloration above, and reduction of reddish patch on the pileum, they tend toward *tropicalis*.

\**Oriolus vetula mcalli* Baird, TEXAN CHACHALACA.—1 ♀, Puente Nacional, 500 ft., July 8, 1941. Chachalacas were common in tropical parts of Veracruz. Our parties reported them from Jalapa, Plan del Río, and Boca del Río, but took no specimens. Birds from Jalapa, although intermediate, are nearer *vetula*, as pointed out by Wetmore (Proc. U. S. Nat. Mus., 93: 245, 1943). In central Veracruz, *mcalli* is a bird of the arid tropical belt, whereas *vetula* occurs in the humid tropical (see Brodkorb, Proc. Biol. Soc. Washington, 55: 181, 1942).

\**Scardafella inca* (Lesson), INCA DOVE.—1 ♀, Puente Nacional, 500 ft., July 7, 1941; 1 ♂, Plan del Río, 1,000 ft., July 29, 1942 (weight 53.4 grams). Inca Doves were common in the arid tropical section of central Veracruz where they doubtless nested, as evidenced by the large testes of the male taken at Plan del Río.

\**Leptotila verreauxi fulviventris* (Lawrence), BUFF-BELLIED DOVE.—1 ♂, Puente Nacional, 500 ft., July 7, 1941; 2 ♂, Plan del Río, 1,000 ft., July 28–29, 1942 (testes enlarged; weight 171 and 181 grams). This large, short-tailed dove was common in arid-tropical portions of central Veracruz, occurring from sea level to at least 4,500 ft. at Jalapa, where we observed it but did not collect specimens.

\**Aratinga astec astec* (Souancé), AZTEC PAROQUET.—1 ♂, 2 ♀, 1 non-sexed, Puente Nacional, 500 ft., July 7–9, 1941. This small paroquet occurred in the riparian vegetation along the small stream that empties into the Río Antigua below Puente Nacional. It was the only member of the parrot family encountered by our party at this locality.

\**Bolborhynchus lineola lineola* (Cassin), BARRED PAROQUET.—1 ♂, Jalapa, 4,500 ft., July 12, 1941; 3 ♀, Jalapa, 4,500 ft., August 2–3, 1942 (weight 51.2 to 54.3 grams). Moderately common in the forested areas along the Río Banderillo. In August, 1942, we observed them in flocks in the taller trees, eating what we took to be berries. They seemed unafraid of man for when we shot into the flock, the remaining birds circled two or three times and again alighted to resume their feeding activity. The ovary of each of the two adult females collected in August was small. The third female is more bluish green ventrally and presumably is a young of the year.

\**Coccyzus minor continentalis* van Rossem, MANGROVE CUCKOO.—1 ♂, Plan del Río, 1,000 ft., July 29, 1942 (testes small; weight 55.8 grams). Apparently rare in Veracruz; the specimen taken was the only one observed by our parties in two seasons of work in that state. It was encountered in the riparian vegetation along the small Río Salado (local name) a short distance east of Plan del Río. Our specimen seems to be the first to be recorded from Veracruz; Loetscher (MS.) does not list the species.

\**Piaya cayana thermophila* Selater, CENTRAL AMERICAN SQUIRREL CUCKOO.—1 ♂, 1 non-sexed, Puente Nacional, July 7, 1941. These long-tailed cuckoos were observed daily in the vegetation along a small creek near camp.

\**Crotophaga sulcirostris sulcirostris* Swainson, GROOVE-BILLED ANI.—1 ♂, 1 ♀, Puente Nacional, 500 ft., July 7–8, 1941; 1 ♂, 1 ♀, Plan del Río, 1,000 ft., July 29, 1942 (weight: male, 85 grams; female, 90.6 grams). Common throughout the tropical sections of eastern México, seeming to prefer arid-tropical vegetation. At Plan del Río and Puente Nacional it was one of the most conspicuous birds. In July, numerous young of the year were in evidence.

\**Tyto alba guatemalae* (Ridgway), CENTRAL AMERICAN BARN OWL.—1 ♀, Jalapa, August 6, 1942 (ovary enlarged; weight 452.8 grams). This specimen constitutes the third record for the state of Veracruz; others have been taken at Orizaba and Córdoba (Loetscher, MS.). It is darker both dorsally and ventrally than *pratincola* from southern Texas, Nuevo León, and the Valley of México, and matches the lighter-colored specimens of *guatemalae* from Central America in the Biological Survey Collection. This record extends considerably northward the known range of this race.

The bird was shot from a tall tree at the edge of a marsh. Mexicans living close by reported Barn Owls to be common. We observed several large owls, presumably of this species, shortly after dusk on several occasions at this locality.

*Streptoprocne zonaris mexicana* Ridgway, MEXICAN COLLARED SWIFT.—5 ♂, 5 ♀,

Plan del Río, 1,000 ft., July 30, 1942; gonads of all adults small (non-breeding condition); average weight, 112 grams (104.7–127.4). Collared Swifts were observed by our parties at Jalapa, Cofre de Perote, Boca del Río, and Puente Nacional, in Veracruz, but we were unable to collect specimens because the birds flew so high. At Plan del Río several thousand Collared Swifts roosted on the nearly vertical rock wall behind a waterfall. There they gathered each night, arriving in considerable numbers at about 6:10 P. M. The flight increased until about 6:30, then diminished, with the last birds arriving shortly before dark. The grayish rocks became black with swifts as they clung to the wall in close formation, with adults and nearly full-grown young of the year roosting together. The latter could be distinguished in flight by the narrowness of the white chest band.

*Amazilia cyanocephala cyanocephala* (Lesson), RED-BILLED AZURE-CROWN.—1 ♀, Jalapa, 4,500 ft., August 3, 1942 (weight 3.6 grams; ovary small). At our Río Banderillo camp numerous individuals were observed sipping nectar from brightly colored flowers and pursuing each other in aerial maneuvers.

\**Trogon melanocephalus melanocephalus* Gould, BLACK-HEADED TROGON.—1 ♂, Puente Nacional, 500 ft., July 7, 1941. This trogon was a rarity at Puente Nacional, where it frequented the more open forest in the narrow valleys.

\**Trogon mexicanus mexicanus* Swainson, MEXICAN TROGON.—1 ♂, Las Vigas, 8,000 ft., August 6, 1942 (testes small; weight 69.3 grams). We observed several adults and young of the year at our Las Vigas camp flying low over small bushes and alighting in pine trees much in the manner of jays. We saw them only in pine or mixed forests.

*Megaceryle torquata torquata* (Linnaeus), RINGED KINGFISHER.—1 ♀, Puente Nacional, 500 ft., July 6, 1941. This large kingfisher was encountered by our parties at a number of localities in México, from Río Ramos, Nuevo León (near Monterrey at an elevation of nearly 1,500 feet) southward through the lowland region to Puente Nacional, Plan del Río, and Vera Cruz. It was extremely difficult to approach within shotgun range; our specimens were all collected by waiting for the birds to fly over. At Puente Nacional and Plan del Río three species (*Chloroceryle amazona*, *C. americana*, and *M. torquata*) occurred together along the same stream, and each apparently got along well with the other two. This suggests sharply defined differences in feeding and breeding requirements.

*Chloroceryle amazona* (Latham), AMAZON KINGFISHER.—1 ♂, 2 ♀, Puente Nacional, 500 ft., July 7, 1941; 3 ♂, Plan del Río, 1,000 ft., July 27–29, 1942 (testes small; weight from 109.5 to 134 grams). This large green kingfisher was common along all the streams we visited in the lowlands of eastern Veracruz. Its range probably extends northward in Veracruz as far as Tampico, as we procured specimens on the Río Axtla, a tributary to the Río Panuco, in southeastern San Luis Potosí.

*Chloroceryle americana septentrionalis* (Sharpe), TEXAS GREEN KINGFISHER.—1 ♂, 1 ♀, Puente Nacional, 500 ft., July 6–7, 1941; 2 ♀, Plan del Río, 1,000 ft., July 28–29, 1942 (gonads small; weight 38.4 and 42.7 grams). This small green kingfisher was abundant along all streams we worked in the lowlands of México from Texas south to Veracruz and Guerrero. It was more numerous than either of the other two kingfishers.

\**Momotus caeruliceps* (Gould), BLUE-CROWNED MOTMOT.—3 ♂, Puente Nacional, 500 ft., July 7–8, 1941. This is the only locality in Veracruz at which we encountered motmots. They were quite common in the riparian growth along a small stream in a canyon a short distance from the village. Although these specimens are from the southern known limit of the range of *caeruliceps*, they show no black in the center of



the crown that would indicate intergradation with the *lessonii* group, which ranges northward from Central America into southern Veracruz.

*Colaptes cafer mexicanus* (Swainson), MEXICAN RED-SHAFTED FLICKER.—1 ♂, Las Vigas, 8,000 ft., August 7, 1942; 3 ♂, Cofre de Perote, 10,500 ft., July 26–30, 1942 (weights varied between 116.6 and 159.8 grams). The Mexican Red-shafted Flicker was one of the conspicuous birds of the coniferous forests of eastern Veracruz, occurring from the lower limits of this belt to timberline. In late July and early August we observed numerous young of the year. The testes of all these specimens, except the one from Las Vigas, were small.

\**Centurus aurifrons grateloupensis* (Lesson), LESSON'S WOODPECKER.—2 ♂, 2 ♀, Puente Nacional, 500 ft., July 6–8, 1941; 1 ♂, 1 ♀, Plan del Río, 1,000 ft., July 27–28, 1942 (gonads small; a male weighed 90.6 grams; a female, 70.3). The Lesson's Woodpecker was common in the arid tropical region of eastern Veracruz.

\**Balanosphyra formicivora formicivora* (Swainson), ANT-EATING WOODPECKER.—1 ♀, Jalapa, July 3, 1941. The Ant-eating Woodpeckers occurred at middle altitudes in the broad-leaved forests, where they probably are non-migratory. At lower elevations, in the arid tropical region, they were replaced by *Centurus* and *Dryobates scalaris*, and at higher elevations, in the coniferous forests, by *Colaptes*, *Dryobates villosus*, and *D. stricklandi*.

\**Dryobates scalaris scalaris* (Wagler), ORIZABA WOODPECKER.—1 ♂, Plan del Río, 1,000 ft., July 28, 1942 (testes small; weight 35.5 grams). This small woodpecker was moderately common in the arid-tropical region near Puente Nacional and Plan del Río.

\**Dryobates villosus jardinei* (Malherbe), JARDINE'S HAIRY WOODPECKER.—2 ♂, 1 ♀, Cofre de Perote, 10,500 ft., July 26–30, 1942 (gonads small; weight, adult male, 56.1 grams; female, 51.7 grams). Although specimens were not collected at Las Vigas, this woodpecker was observed there on several occasions. Seemingly this species occurs in all the pine forests of the 'tierra fria,' from an elevation of 7,000 feet to near timberline. They prefer thickly wooded areas in which the trees are large.

\**Lepidocolaptes affinis affinis* (Lafresnaye), ALLIED WOOD-HEWER.—1 ♂, Las Vigas, 8,000 ft., August 7, 1942 (testes small; weight 28.0 grams). This species was observed by our party only in the pine forests near Las Vigas. The individual collected was feeding on the trunk of a tall pine much in the manner of a creeper.

\**Tityra semifasciata* subsp.?, TITYRA.—1 ♂ im., Puente Nacional, 500 ft., July 8, 1941. This species was encountered by our parties only at Puente Nacional where it occurred in the tropical vegetation in the canyons. This specimen is much paler above than any Mexican specimen of *personata* available for comparison. In color it is nearest examples of *deses* from Yucatan, but is slightly paler and distinctly more grayish. In body color it resembles *griseiceps*, but is more brownish and has a darker head. It differs markedly from the dark brown specimens available from southeastern Coahuila, San Luis Potosí, and southern Veracruz.

\**Sayornis saya saya* (Bonaparte), SAY'S PHOEBE.—1 ♂, Guadalupe Victoria, 8,300 ft., July 30 (weight 29.6 grams). The presence of this species in Veracruz in late July suggests that it may possibly breed in the vicinity of Perote and Guadalupe Victoria. The testes of this individual were small, however, so it may have been an early migrant.

\**Sayornis nigricans nigricans* (Swainson), BLACK PHOEBE.—1 ♂, Jalapa, 4,500 ft., July 2, 1941. The Black Phoebe was a fairly common summer bird on the plateau of central México, but its occurrence at Jalapa was unexpected. Several individuals were noted along the river near the village of Banderillo. These birds probably nested in the vicinity.



\**Tyrannus melancholicus couchii* Baird, COUCH'S KINGBIRD.—1 ♂, young, Jalapa, 4,500 ft., July 3, 1941; 1 ♂, Jalapa, 4,500 ft., July 30, 1942; 1 ♂, Plan del Río, 1,000 ft., July 29 (adults weighed approximately 45 grams). This flycatcher was one of the common tyrannids in the lowlands of Veracruz, reaching an elevation of at least 4,500 feet at Jalapa. The adult male from Jalapa is darker both ventrally and dorsally than specimens from Plan del Río and from Nuevo León. Also, it is smaller (wing 106.5 mm., tail 85), suggesting that it may possibly represent the race *T. m. chloronotus*. The specimen from Plan del Río differs in no essential from specimens from northeastern México (typical *couchii*).

\**Legatus leucophaeus variegatus* (Sclater), GREATER STRIPED FLYCATCHER.—1 ♂, Jalapa, 4,500 ft., July 2, 1941. This medium-sized flycatcher was observed by our parties only at Jalapa where one specimen was taken in riparian vegetation along the Río Banderillo, near the village of San Lucas Martín.

\**Myiodynastes luteiventris luteiventris* Sclater, SULPHUR-BELLIED FLYCATCHER.—1 ♂, Puente Nacional, 500 ft., July 8, 1942. This species was fairly common in the lowlands of eastern México from Monterrey south at least to Vera Cruz. It seemingly is partial to a riparian habitat.

*Megarynchus pitangua mexicanus* (Lafresnaye), MEXICAN BOAT-BILLED FLYCATCHER.—1 ♂, Puente Nacional, 500 ft., July 8, 1941; 1 ♂, 1 ♀, Plan del Río, 1,000 ft., July 27, 1942 (testes enlarged, but ova of female small; adult male weighed 83.9 grams; female, 76.8). This large yellow-bellied flycatcher was commonly observed in the more open country of eastern Veracruz, often being one of the conspicuous birds along the highways. Its range northward in Veracruz extends at least as far as the drainage system of the Panuco River as we have specimens from the Río Axtla.

*Myiozetetes similis texensis* (Giraud), GIRAUD'S FLYCATCHER.—1 ♂, 1 ♀, Jalapa, 4,500 ft., July 2, 1941; 1 ♂, 3 ♀, Plan del Río, 1,000 ft., July 24–29, 1942 (gonads small; adult male weighed 35.8 grams; adult females, 33.1; 34.4; 36.6 grams). This species was by far the most abundant flycatcher in the lowlands of Veracruz. It seemed to have a preference for xerophytic vegetation and open, brush-dotted pastures. In late July, numerous young of the year were in evidence.

\**Myiochanes richardsonii sordidulus* (Sclater), MEXICAN WOOD PEWEE.—1 ♂, Cofre de Perote, 10,500 ft., July 29, 1942 (testes small; weight 13.2 grams). The Mexican Wood Pewee was not a conspicuous summer bird on Cofre de Perote, but it doubtless breeds there.

\**Empidonax affinis affinis* (Swainson), FULVOUS-BREASTED FLYCATCHER.—1 ♂ juv., Las Vigas, 8,000 ft., August 2, 1942 (weight 11.3 grams). This flycatcher, determined as *affinis* by Van Tyne, was found by us in Veracruz only at this locality, although special efforts were made to collect specimens of *Empidonax* elsewhere. The bird was in a pine association.

\**Otocoris alpestris chrysolaema* (Wagler), MEXICAN HORNED LARK.—3 ♂, 3 ♀, Guadalupe Victoria, 8,300 ft., July 28–30, 1942. The Mexican Horned Lark was a common summer bird of the semi-arid plateau above an elevation of 7,000 feet. In Veracruz, we observed it at Limón, Guadalupe Victoria, Perote, and as far east as near Cruz Blanca where the prairie gives way to pine forests. At the time of our visit, numerous small flocks, composed mostly of nearly full-grown young, were observed at the localities listed above. The species was not seen elsewhere in Veracruz. Adult males weighed 28.8 and 31.2 grams; immature male, 29.6 grams; females averaged 27 grams (26.4–28.0). Two of the females and one of the males had enlarged gonads.

*Tachycineta thalassina thalassina* (Swainson), MEXICAN VIOLET-GREEN SWALLOW.

—1 ♂ juv., Guadalupe Victoria, 8,300 ft., July 29, 1942 (weight 27.6 grams). This specimen establishes with some degree of certainty the Mexican Violet-green Swallow as a breeding bird in Veracruz. It is small for *thalassina* (wing 115 mm.), but larger than specimens of *lepida* of comparable age from western Texas.

*Stelgidopteryx ruficollis fulvipennis* (Sclater), SALVIN'S ROUGH-WINGED SWALLOW.—1 ♂ juv., Jalapa, 4,500 ft., July 2, 1941; 1 ♀ juv., Jalapa, 4,500 ft., August 4, 1942 (weight 16.9 grams). Rough-winged Swallows were abundant at our Río Banderillo camp where they fed daily over a small marsh and water-storage pond.

*Psilorhinus morio morio* (Wagler), BROWN JAY.—2 ♂, Puente Nacional, 500 ft., July 7–8, 1941. Brown Jays were the most conspicuous members of the Corvidae in the lowlands of central Veracruz. At Puente Nacional they showed preference for fence rows in open range land, and family groups kept in a loose flock as they moved from place to place. In early July, young of the year were nearly full grown.

*Xanthoura yncas luxuosa* (Lesson), GREEN JAY.—1 ♂, Jalapa, 4,500 ft., July 2, 1941. The Green Jay was infrequently observed in Veracruz. This specimen was taken in a 'jungle' of chaparral bordering a cornfield along the Río Banderillo. Two others were observed there, but they were too wary to be approached within shotgun range.

*Apelocoma coerulescens sumichrasti* (Ridgway), SUMICHRAST'S JAY.—1 ♀, Cofre de Perote, 10,500 ft., July 26, 1942 (ova small; weight 94.3 grams). Of the three species of jay that occur on the slopes of Cofre de Perote, this one was by far the rarest, although it was common in the broken juniper-pine areas farther west at lower elevations. This is probably the third or fourth specimen known from Veracruz, but additional collecting may reveal that it is not so rare as present evidence indicates.

*Apelocoma sordida sieberii* (Wagler), SIEBER'S JAY.—2 ♂ im., Cofre de Perote, 10,500 ft., July 29, 1942 (weights 123.3 and 132.7 grams). Sieber's Jays were not common on Cofre de Perote, but that they do nest on the mountain is evidenced by the family group observed on July 29 from which these two specimens were taken. The birds are molting, but most of the ventral feathers are of the juvenal plumage.

*Cyanocitta stelleri coronata* (Swainson), BLUE-CRESTED JAY.—3 ♂, 4 ♀, Cofre de Perote, 10,500 ft., July 26–31, 1942. This was the most common jay on the slopes of Cofre de Perote. Family groups were observed several times in late July, when the young of the year were nearly full grown and much in evidence.

Loetscher (MS.) devotes considerable attention to a discussion of the relationships of *C. s. azteca* and *C. s. coronata*; the crux of the problem has to do with the color of the crown. In the original description of *coronata*, the crown is indicated as blue; in *azteca*, as black "more or less tinged with blue." Both subspecies have been reported from the same localities in Veracruz. The series of *C. stelleri* obtained by our party in México throws additional light on this problem.

In the series from Cofre de Perote the color of the crest ranges from 'light' blue through a darker blue to blackish blue. Nearly the same condition is found in a series of ten specimens from Monte Río Frío (10,500 ft.), 55 kilometers east of México City. Three topotypes of *azteca* in the U. S. National Museum are equally intermediate between the black-headed and blue-headed races. Two of them are definitely blue-headed; one is black-headed.

The average color of the crown of specimens from central México is darker, more blackish, than those from Cofre de Perote, but the fact remains that considerable variation in color is present in both series and these variations are approximately equal—the Cofre de Perote specimens vary farther to the side of blue, the ones from near Río Frío, to the black. Since all our specimens were taken before any migration could have mingled populations, it seems clear that we have to do with two variable subspecies, neither one of which is well differentiated except in the extreme variants.

To establish the identity of *azteca*, it becomes necessary to establish a more restricted type locality for *coronata*. The type of *azteca* was from the mountains near Mirador, Veracruz; that of *coronata* was collected by Bullock from "the tableland" of Mexico. Perusal of Bullock's 'Six Months Travels in Mexico' reveals that he visited a relatively limited area which could have been the source of the type of *coronata*. He made the round trip between Vera Cruz and México City by way of Jalapa, Perote, Puebla, and Río Frío, stopping at all of these places. At Perote he first emerged onto "the tableland." In reaching the town of Perote, which is situated in the arid desert lands, it was necessary for him to cross through the pine forest that extends down the northeastern slopes of Cofre de Perote, through the present town of Las Vigas and on down the mountainside a short distance. This tract of timber is at present occupied by *coronata*. *Cyanocitta stelleri* does not occur at Jalapa or Puebla, two of the other localities Bullock mentions.

On pages 444 and 445, in the account of his travels back to Vera Cruz from México City, Bullock mentions stopping at Río Frío. In fact he was forced to stop there, as his wagon broke down at a near-by locality called San Martín. He called this a high, cold situation, and while stopping there he collected several species of birds, including "two kinds of blue jays . . . all undescribed." The fact that Bullock mentioned that the jays found at Río Frío were new indicates that he had not encountered them before, and would virtually eliminate the possibility of his having taken them at Cofre de Perote *on the way in*. Of course, he could have taken them *on the way out*. It seems likely that Swainson's type of *coronata* would have been one of these birds.

Swainson does not state how blue the crowns of his birds were. In his description of *Garrulus coronatus* [Philos. Mag. (n. s.), 1 (5): 437, June, 1827] he states that *coronatus* is "crested; blue, sides of head blackish; chin, front, and eyebrows whitish." This statement could refer to almost any of the variants found on the tableland. Another

confusing statement in Swainson's description is that "this elegant bird, remarkable for its full and lengthened crest, occurs in various parts of the tableland." This would indicate that he had specimens from more than one locality before him. As suggested to J. W. Aldrich by A. J. van Rossem (*in litt.*), he may even have had some specimens from Real del Monte that were almost certainly not taken by Bullock, but by a Mr. Morgan. Swainson's type of *coronata* cannot be found.

In view of the extreme uncertainty as to where the type specimen of *coronata* was taken, and the probability that the original description was based on specimens from several scattered localities, it seems justifiable to choose either Cofre de Perote or Río Frío as the type locality, since *C. stelleri* is known to occur at both of these places and Bullock was known to have collected there. Because the jays in the vicinity of Río Frío are black-headed, not blue-headed, it seems advisable to restrict the type locality of *coronata* to the vicinity of Cofre de Perote where blue-headed birds do occur.

This conclusion is in disagreement with that reached by Brodkorb (Auk, 61: 400-404, 1944) who restricted the type locality to Real del Monte, Hidalgo, a locality not mentioned by Bullock in his 'Travels.'

The type specimen of *azteca* was collected in June, 1864, by Dr. C. Sartorius near Mirador, Veracruz, and entered in the catalog of the U. S. National Museum on February 6, 1865. Since Mirador is also on the eastern edge of the highlands and is only a short distance from the Cofre de Perote, it seems that Ridgway described an extreme variant toward the black in a population whose normal color is bluish. Because of this, it seems necessary to place *azteca* in the synonymy of *coronata*, which has priority by more than half a century. This procedure leaves the birds from the high mountains in the vicinity of México City without a name. I propose that they be known as

#### ***Cyanocitta stelleri atriceps*, new subspecies**

*Type*.—Male, adult; no. 3398, Texas Cooperative Wildlife Research Collection; north slope of Mount Popocatepetl, 13,500 feet, state of México, México; collected July 20, 1942, by Joseph M. Vajdos; original number 88.

*Diagnosis*.—A member of the *Cyanocitta stelleri* group with crest dark blue or black. Differs from *C. s. coronata*, as known to me by seven specimens from the Cofre de Perote, Veracruz, in slightly larger size and darker color; the blue of back, tail, wings, and crest deeper.

*Measurements*.—Averages and extremes of eight adult males: wing,



148 mm. (141-153); tail, 138 (130-148); exposed culmen, 27.8 (26.0-28.8); depth of bill at nostril 9.5 (9.0-10.3); tarsus, 43.1 (41.2-44.5). Of four adult females: wing, 147 (143-151); tail, 136 (131-144); exposed culmen, 27.0 (24.5-29.4); depth of bill at nostril, 9.4 (9.0-9.5); tarsus, 43.1 (42.0-44.0).

*Specimens examined.*—4 ♀, 11 ♂, from the high mountains in the state of México, as follows: Mount Popocatepetl, 13,500 ft., 3; Laguna Zempoala, 45 km. southwest of México City, 9,400 ft., 2; Monte Río Frío, 45-55 km. east-southeast of México City, 10,000-10,500 ft., 10.

\**Parus sclateri sclateri* Kleinschmidt, SOUTH MEXICAN CHICKADEE.—1 ♂, Las Vigas, 8,000 ft., August 7, 1942 (testes small; weight 11.3 grams). We observed this chickadee daily at all camps in the coniferous forests of central México, including Las Vigas and Cofre de Perote. In early August, family groups of adults and nearly full-grown young were much in evidence.

\**Sitta pygmaea flavinucha* van Rossem, YELLOW-NAPED PYGMY NUTHATCH.—1 ♂, Cofre de Perote, 10,500 ft., August 4, 1942 (testes small; weight 15.7 grams). Pygmy Nuthatches were seen daily on Cofre de Perote and again at Las Vigas. In late July and early August, numerous young of the year were following their parents in family groups.

\**Troglodytes brunneicollis* subsp.?, BROWN-THROATED WREN.—1 ♂, Las Vigas, 8,000 ft., August 4, 1942; 1 ♂, Cofre de Perote, 10,500 ft., July 30, 1942 (testes small; weights 13.0 and 13.6 grams). These small wrens were abundant in the coniferous forests of the central Mexican highlands. Veracruz specimens of this wren are more grayish brown than typical *brunneicollis* from Oaxaca and are darker and more grayish than *culaquita* from the vicinity of México City. The Veracruz population apparently represents an undescribed race.

\**Heleodytes rufinucha rufinucha* (Lesson), RUFOUS-NAPED CACTUS WREN.—1 ♀, Puente Nacional, 500 ft., July 7, 1941; 1 ♂, 1 ♀, Plan del Río, 1,000 ft., July 28, 1942 (adult male weighed 31.8 grams; adult female, 28.9 grams). This large wren was common in the arid tropical region of central Veracruz below an elevation of 4,000 feet. The male from Plan del Río had enlarged testes.

\**Melanotis caerulescens caerulescens* (Swainson), BLUE MOCKINGBIRD.—1 ♀, Jalapa, 4,500 ft., July 2, 1941. Contrary to the experience of other investigators, we encountered this species only once in two seasons of collecting in central Veracruz. This specimen was taken in a thicket of small, broad-leaved trees near a cornfield.

\**Toxostoma curvirostre curvirostre* (Swainson), CURVE-BILLED THRASHER.—1 ♂, Cofre de Perote, 10,500 ft., July 26, 1942 (testes small; weight 77.4 grams). The occurrence of this typically desert bird on the pine-clad slopes of Cofre de Perote was entirely unexpected. It was observed on several occasions in the desert at Laguna Alchichica, across the line in Puebla, where two specimens were taken, and at Limón in the extreme western arid highlands of Veracruz. Probably the bird on Cofre de Perote was a post-nesting straggler.

Specimens from east of the Valley of México are very pale above and below and are lightly spotted. Apparently they are different from typical *curvirostre* (cf. Moore, Proc. Biol. Soc. Wash., 54: 214, 1941).

\**Turdus migratorius phillipsi* Bangs, VERA CRUZ ROBIN.—1 ♂, 1 ♀, Las Vigas, 8,000 ft., August 7, 1942; 2 ♂, 3 ♀, Cofre de Perote, 10,500 ft., July 29-August 5, 1942 (adult males weighed 78.3 and 78.6 grams; females 74.2, 74.3 and 81.4 grams).



This species was common in the forested areas of the central plateau, occurring in all of the coniferous forests visited by us. At Las Vigas and on Cofre de Perote it was common in July and August, when the spotted young of the year were seen following the older birds about in family groups.

\**Turdus assimilis assimilis* Cabanis, JALAPA ROBIN.—1 ♀, Jalapa, 4,500 ft., July 2, 1941. This thrush seems to be relatively rare in central Veracruz, as we observed it only once in 1941 and it was not encountered at all in our short stay at Jalapa in 1942. *Turdus grayi* appears to outnumber *assimilis* ten to one.

\**Turdus grayi tamaulipensis* (Nelson), TAMAULIPAS THRUSH.—2 ♂, Jalapa, 4,500 ft., July 2, 1941; 3 ♂, 1 ♀, Plan del Río, 1,000 ft., July 27–30, 1942 (adult males weighed from 79.3 to 88.3 grams; adult female, 88.5 grams). This thrush was common in the open broad-leaf forests, cultivated areas, and pastures. Its vertical range in Veracruz appears to be below 5,000 feet, but that it can be expected to ascend higher is evidenced by the fact that we have a breeding female from the northern plateau (Tasquillo, Hidalgo) at an elevation approaching 6,000 feet. The testes of specimens taken in late July were still enlarged and a female had a well-defined brood patch. Our specimens are somewhat darker above than typical *tamaulipensis* from Ciudad Victoria, but they are closer to this race than to the more rufescent *grayi* of Guatemala.

\**Myadestes obscurus obscurus* Lafresnaye, BROWN-BACKED SOLITAIRE.—1 ♂, Jalapa, 4,500 ft., July 4, 1941. We found this bird only at Jalapa. It was taken in a riparian association along the Río Banderillo a short distance from the village of San Lucas Martín.

\**Catharus occidentalis occidentalis* (Sclater), RUSSET NIGHTINGALE THRUSH.—1 ♂, Las Vigas, 8,000 ft., August 3, 1942 (testes small; weight 26.2 grams). This thrush was fairly common at Las Vigas. This race doubtless is the breeding bird in the vicinity of Las Vigas as it is on Pico de Orizaba. We collected specimens of the paler race (*C. o. fulvescens*) only in the mountains near México City.

\**Sialia sialis guatemalae* Ridgway, GUATEMALAN BLUEBIRD.—1 ♀, Jalapa, July 4, 1941; 2 ♀, Jalapa, August 3, 1942 (adult female weighed 28.4 grams). This species was collected only at Jalapa, but bluebirds thought to be of this race were observed near Las Vigas. In early August, family groups of adults and nearly full-grown juveniles were observed daily in the brush and trees surrounding a small marsh north of Jalapa.

\**Sialia mexicana australis* Nelson, NELSON'S BLUEBIRD.—1 ♂, Cofre de Perote, 10,500 ft., July 27, 1942 (weight 32.9 grams). Nelson's Bluebird is characteristic of the central highlands. We encountered it in Veracruz only at Las Vigas and on Cofre de Perote. At the time of our visit, numbers of nearly full-grown young accompanied their parents in family groups.

\**Vireo huttoni mexicanus* Ridgway, MEXICAN VIREO.—1 ♀, Las Vigas, 8,000 ft., July 31, 1942 (ova minute, weight 13.6 grams). This vireo was common in the coniferous forests of the central Mexican plateau, occupying an altitudinal range from about 7,000 to 12,000 feet.

\**Tangavius aeneus aeneus* (Wagler), RED-EYED COWBIRD.—1 ♀, 4 ♂, Jalapa, 4,500 ft., July 30, 1942; 1 ♂ juv., Plan del Río, 1,000 ft., July 27, 1942 (female weighed 62.4 grams; four males averaged 70.4 (69.3–72.2) grams). Red-eyed Cowbirds were the most conspicuous birds observed at our Río Banderillo camp north of Jalapa, where, in late July and early August, they congregated in large flocks.

\**Cassidix mexicanus mexicanus* (Gmelin), GREAT-TAILED GRACKLE.—1 ♂ juv., 1 ♀, Puente Nacional, 500 ft., July 8, 1941; 1 ♀, Jalapa, 4,500 ft., July 30, 1942

(adult female weighed 122.3 grams). The Great-tailed Grackle was one of the commonest birds observed in Veracruz below an altitude of 5,000 feet. The bird was again encountered on the plateau in the state of Puebla, suggesting that the altitudinal range in Veracruz may be as high as 7,500 feet in favorable localities.

\**Dives dives dives* (Lichtenstein), SUMICHRAST'S BLACKBIRD.—2 ♂, Puente Nacional, 500 ft., July 6-7, 1941; 2 ♀, Plan del Río, 1,000 ft., July 27, 1942 (ova small; adult females weighed 101 and 102 grams). Common in the tropical parts of Veracruz from sea level to at least 2,000 feet.

\**Icterus spurius* (Linnaeus), ORCHARD ORIOLE.—1 ♂, Plan del Río, 1,000 ft., July 27, 1942 (testes small; weight 20.8 grams). The presence of the Orchard Oriole at Boca del Río in mid-July (one specimen taken) and at Plan del Río in late July suggests that the species may remain the year round in Veracruz. Loetscher (MS.) reports the species for May 15.

\**Icterus gularis tamaulipensis* Ridgway, ALTA MIRA ORIOLE.—3 ♂, 1 ♀, Puente Nacional, 500 ft., July 6-8, 1941; 2 ♂, 2 ♀, Plan del Río, 1,000 ft., July 30, 1942 (adult male weighed 78.2 grams). This oriole was a common inhabitant of the arid-tropical region of Veracruz where, in summer, it was the most conspicuous member of the genus. Three of the specimens from Plan del Río were nearly full-grown young of the year; the testes of an adult male were enlarged.

\**Thraupis abbas* (Lichtenstein), ABBOT TANAGER.—1 ♀, Puente Nacional, 500 ft., July 8, 1941; 1 ♂, 2 ♀, Plan del Río, 1,000 ft., July 28, 1942 (two females weighed 41 and 48 grams; the male, 41 grams). Common in the arid-tropical part of central Veracruz. At both the localities mentioned above the birds were taken in a riparian association. The ova of the females were small, but the testes of the male were considerably enlarged.

\**Piranga flava dextra* Bangs, EASTERN HEPATIC TANAGER.—1 ♂, 1 ♀, Las Vigas, 8,000 ft., August 6-7, 1942 (gonads small; male weighed 49.1 grams; female, 45.3 grams). This tanager was observed frequently at Las Vigas and near Conejo on the north slope of Cofre de Perote, although no specimens were collected at the latter locality. At these stations it occurred in stands of pines.

\**Piranga bidentata sanguinolenta* Lafresnaye, LAFRESNAYE'S TANAGER.—1 ♀, Jalapa, 4,500 ft., July 2, 1941. This tanager was uncommon in central Veracruz; we observed it once in two visits to that section of the state. This specimen was taken in a riparian association.

*Habia gutturalis salvini* (Berlepsch), SALVIN'S ANT TANAGER.—1 ♀, Puente Nacional, 500 ft., July 6, 1941. This appears to be another rare tanager in central Veracruz. Its seeming rarity may be due to its seclusive habits, preferring, as it does, the denser thickets.

*Chlorospingus ophthalmicus ophthalmicus* (Du Bus), BROWN-HEADED CHLOROSPINGUS.—1 ♂, Jalapa, 4,500 ft., July 2, 1941. We recorded this species only at Jalapa.

\**Salinator atriceps atriceps* (Lesson), BLACK-HEADED SALTATOR.—1 ♂, Puente Nacional, 500 ft., July 6, 1941. This large, black-headed, green-backed fringillid was moderately common in the tropical parts of central Veracruz. At Puente Nacional it occurred in the dense riparian vegetation along the Río Antigua.

\**Salinator coerulescens grandis* (Lichtenstein), LICHTENSTEIN'S SALTATOR.—1 ♂, Plan del Río, 1,000 ft., July 28, 1942 (testes enlarged; weight 58 grams). This somber-colored saltator is by far more common than *S. atriceps* in central Veracruz. We observed it frequently at Boca del Río and Plan del Río.

\**Richmondia cardinalis coccinea* (Ridgway), JALAPA CARDINAL.—1 ♀, Plan del

Río, 1,000 ft., July 29, 1942 (ova small; weight 37.3 grams). Common in the arid-tropical section of central Veracruz.

\**Passerina versicolor versicolor* (Bonaparte), VARIED BUNTING.—1 ♂, Jalapa, 4,500 ft., July 8, 1941; 1 ♀, Plan del Río, 1,000 ft., July 29, 1942 (adult male weighed 13.6 grams). The Varied Bunting was fairly common in central Veracruz. Loetscher (MS.) records it only from Jalapa and Orizaba on the basis of old records by Sclater. We observed several individuals at Jalapa and Plan del Río and the enlarged testes of the male from the latter locality establish the species as a breeding bird in the area.

\**Hesperiphona vespertina montana* Ridgway, MEXICAN EVENING GROSBEEK.—2 ♀, Cofre de Perote, 10,500 ft., August 4, 1942 (weights 52.3 and 53.6 grams). We recorded the Mexican Evening Grosbeak in Veracruz only on Cofre de Perote, where it was not common. The two specimens taken had minute ova; the birds were molting.

\**Spinus pinus macropterus* (Bonaparte), MEXICAN PINE SISKIN.—2 ♂, 3 ♀, Cofre de Perote, 10,500 ft., July 26–28, 1942 [average weight 13.3 (12.0–13.9) grams]. This siskin was as numerous as the Striped Ground Sparrow (*Plagiospiza*) in the coniferous regions of central México. Its distribution in summer coincides with that of pines and firs and on Cofre de Perote it occurred in considerable numbers. The birds were just entering the breeding season in late July; females contained ova as large as 5 mm. in diameter and the testes of males were considerably enlarged.

\**Spinus notatus notatus* (Du Bus), BLACK-HEADED SISKIN.—1 ♂, Jalapa, 4,500 ft., July 4, 1941; 1 ♀, Jalapa, 4,500 ft., August 3, 1942 (weight 14.5 grams). At Jalapa this siskin was common in tree-bordered meadows and cornfields. Often it associated with *S. p. psaltria*. The ovary of the female was enlarged.

\**Spinus psaltria psaltria* (Say), ARKANSAS GOLDFINCH.—1 ♂, Jalapa, 4,500 ft., July 2, 1941; 1 ♂, 1 ♀, Jalapa, 4,500 ft., July 31, August 3, 1942 (weights 10.1 and 10.0 grams). Common in the vicinity of Jalapa. It was partial to weed patches, cornfields, and other open terrain. Frequently it occurred in mixed flocks with *Spinus notatus*.

\**Pipilo ocai ocai* (Lawrence), COLLARED TOWHEE.—2 ♂, 1 ♀, Las Vigas, 8,000 ft., August 7, 1942; 1 ♂, 1 ♀, Cofre de Perote, 10,500–11,500 ft., July 26, 30, 1942 (females weighed 51 and 53.2 grams; males 48.0, 52.6, and 53.8 grams). We found this towhee to be restricted in summer to the coniferous belt above an elevation of 7,500 feet. It was a common breeding bird at Las Vigas and near Conejo on Cofre de Perote. One of the males from Las Vigas is immature; the ova of the adult female were enlarged, suggesting two or more broods yearly. For use of the name *ocai* rather than *torquatus*, see van Rossem (Wilson Bull., 52, no. 3: 173–174, 1940).

\**Pipilo fuscus potosinus* Ridgway, PLATEAU BROWN TOWHEE.—1 ♀, Guadalupe Victoria, 8,300 ft., July 30, 1942 (ova enlarged; weight 50.6 grams). Common residents of the deserts of eastern México, occurring in Veracruz in the vicinity of Limón and Guadalupe Victoria. I have compared specimens from Laguna Alchichica, Tlaxcala, Pachuca, and Guadalupe Victoria with near topotypes of *P. f. fuscus* from the Valley of México and am convinced that the Brown Towhees from the eastern and northern sections of the Mexican plateau are inseparable from each other and yet separable from *fuscus*. The possibility suggested by Loetscher (MS.) that the bird of Veracruz is not *potosinus* cannot be confirmed or refuted by materials available as I have examined no specimens from near the type locality of *potosinus*. Measurements and color of birds from the eastern plateau, however, are essentially those recorded for *potosinus*.

\**Plagiospiza superciliosa superciliosa* (Swainson), STRIPED SPARROW.—2 ♂, 2 ♀,

Las Vigas, 7,900 ft., July 30-31, 1942; 2 ♂, 1 ♀, Cofre de Perote, 10,500 ft., July 30-August 4, 1942 [males averaged 46.3 grams (40.0 to 53.7); two adult females, 38.3 and 39.8 grams]. This sparrow is characteristic of the coniferous belt of central México. It occurred on all the high mountains visited by us (Cofre de Perote, Orizaba, Popocatepetl, Iztaccihuatl, Tres Cumbres, etc.) at elevations ranging from 7,900 feet at Las Vigas to nearly 14,000 feet on Mount Popocatepetl. It preferred open meadows and was one of the common timberline sparrows. One of the females from Las Vigas is a nearly full-grown young of the year. The adult female had a well-developed brood patch and the testes of the two males were considerably enlarged.

\**Aimophila rufescens rufescens* (Swainson), RUSTY SPARROW.—1 ♀, Jalapa, 4,500 ft., July 2, 1941. Widely distributed in central Veracruz, preferring thickets in the vicinity of water.

*Junco phaeonotus phaeonotus* Wagler, MEXICAN JUNCO.—1 ♂, Las Vigas, 8,000 ft., August 4, 1942; 1 ♂, Cofre de Perote, 10,500 ft., August 4, 1942 (testes small; weights 21.5 and 22.5 grams). A common breeding bird in the conifer-clad areas of the Mexican plateau, occupying an altitudinal range from near 7,000 feet to timberline (specimens were taken on Mt. Popocatepetl at 13,500 feet).

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## THE HOMING ABILITY OF THE CARRIER PIGEON ITS VALUE IN WARFARE<sup>1</sup>

BY LIEUT. J. A. C. NICOL, ROYAL CANADIAN CORPS SIGNALS

THE homing ability of the carrier or homing pigeon<sup>2</sup> is, in a general way, well known—so much so that this, their chief characteristic, is frequently employed in metaphor and simile as an expression of precision and accuracy which would rebound much to the discomfiture of the writer were all in full possession of the relevant facts. In the light of recent occurrences, the subject is not without topical interest and the biologist, on examining the data and experiments described below, may be able to fill in some of the gaps which puzzle the pigeon enthusiast. For the latter invariably knows his birds well, develops his own method of selecting the wheat from the chaff, from personal experience constructs his own theories, but all too often fails to view his subject objectively and shrouds his conclusions with an anthropomorphic and teleological aurora that defies clear vision.

It is the intention of the writer to review in this paper the known achievements of the homing pigeon; the uses to which they have been

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<sup>2</sup> The terms "carrier" and "homing" pigeon are used interchangeably in this paper.



put in peace and war (described for the benefit of interested readers who may not have had access to the scattered literature on this subject); and to discuss the ways in which they have been used in the present war in so far as it may be told. Finally, an attempt will be made to correlate the problem of the homing ability of this domesticated species with the homing abilities of migratory birds in general in order to discover what light the former will shed on the subject as a whole.

Darwin (1) has shown that the homing pigeon has been evolved from the wild rock-dove which still breeds in western England and which, by continued artificial selection, has been developed into the bird employed today. Moreover, the modern homer is the result of the cross-breeding of several distinct varieties of domestic pigeon and, as such, originated in the nineteenth century although only within the past hundred years have its homing abilities been widely used. Pigeon racing in the past has been a very popular sport in western Europe and even more so in Great Britain. To a smaller extent pigeon races have been held in North America where some of the events have been characterized by abnormally long distances. Annually, the young and the old bird races have attracted many participants and as the result of the selection which these races have exercised, a bird strong in physique, which can be relied upon to return to a known loft after proper training, has been obtained. Certainly the homer is larger than its wild progenitor. Little is known of the homing ability of the rock-dove whose major flights seem to be from feeding grounds to social nesting sites. Consequently, the following is the maximum which can be predicated:—

1. Selection has favored homers with best physique and homing ability. It is impossible to distinguish the relative importance of these two factors in the case of any winning bird.
2. The modern homer possesses homing ability at least as nice as that of the natural species.

Details of training programs used by pigeon racers are as varied as the number of participants and every gradation can be found from the case of the man who swears by the effects of night water or chimney sweepings to the person who calculates his procedure with graphic accuracy. The following, however, is a general and representative picture. Young birds are purchased or hatched in a loft and are settled in that site as their permanent home. They are weaned and gradually learn to fly short distances. By judicious attention and handling, the fancier accustoms the bird to his presence. They are



released daily for exercise and they fly about the immediate loft area, gradually becoming stronger on the wing and learning to maintain close flock formation ("kitting"). They are fed only on return to the loft and birds which fail to enter the trap readily may be penalized until their performance improves. Some particular call is utilized to call the birds back to the loft, usually the sound of dry corn rattling in the feed tin. After this preliminary training, birds are selected for the different events and are sent away varying distances on the flight route which will be followed during the actual race. They are released at these points and fly home. A program of tosses for a long-distance race might be somewhat as follows:  $\frac{1}{2}$  mile;  $\frac{1}{2}$ ; 1; 1; 2; 3; 5; 10; 16; 25; 40; 60; 90; 130; 175; and 250 miles. And in the final toss, at the time of the actual race, the bird may be jumped to 500 miles. Breeding is utilized as a stimulus to return by certain fanciers who try to arrange that the racing birds will have eggs or young at some particular stage of development at the time of the race, and breeding may be employed also to alter the time of the molt so that the bird will have the maximum number of pinions on race-day.

This homing ability of the pigeon, in common with the migratory habits of other species, early attracted notice. Most of the classical references to message carrying by pigeons can be discounted due to technical inaccuracies, and it is not until the nineteenth century that we find authentic instances. During the siege of Paris, homers were carried out of the city by balloon and were used to carry correspondence inscribed on collodion film into the beleaguered city. The proportion of returns was about 17 per cent. Despatches were also carried by pigeon during the siege of Ladysmith and to isolated garrisons in Nigeria shortly after the Boer War. These birds have also been employed by various prominent newspaper companies to obtain detailed news of sporting events in time for their several editions. But it was in the war of 1914 to 1918 that the homing pigeon was first extensively used as a means of communication. Here it played a remarkable rôle in many fields. Birds were sent out with trawlers and mine-sweepers which at first lacked wireless as a means of communication. They were dropped by plane over enemy-occupied territory to be used by agents and sympathizers. And, finally, thousands of birds were used by the services on the western front as an aid to communication.

The method employed by the army was briefly as follows. Lofts were settled somewhere behind the lines, frequently at divisional headquarters and preferably close to a signal office or message centre. Young birds were favored and thoroughly accustomed to their location

by long residence and exercise flights. They were then carried away increasing distances from the loft along the route which would be followed during actual operations and released to fly home. Finally, when trained, they were carried up to battalion and company headquarters in suitable panniers by despatch riders and orderlies before an attack and were released by commanders to send reports and requests for support to headquarters in rear. Osman (2) states that such birds homed faithfully in 99 per cent of the cases.

The advantages of using pigeons in this type of warfare were numerous. It was very economical of human lives since many runners would otherwise have been killed in crossing shell-torn country with messages, whereas the birds were hard to shoot on the wing and could pass over shelled areas with relative impunity, and even when wounded would press on as long as they could fly. They were not disturbed by shell fire as long as the loft itself was not hit nor badly shaken. They were much less susceptible to certain types of poison gas than men. Skilled operators were not required to release them in forward and exposed areas. Against this must be set the fact that they were unreliable in fog, smoke or darkness; that they would only carry messages in one direction, and that they lacked mobility in the sense that long residence was required before the bird could be relied upon as a messenger in any locality.

On the outbreak of hostilities in 1939, the use of pigeons in warfare required re-examination since it was soon apparent that many of the signals problems of the War of 1914 to 1918 were not applicable to this new warfare with its terrible alterations in tempo and method. Pigeons are again being carried by naval vessels and also by planes of the air forces. The latter have evolved special techniques for their release from aircraft but, interesting as such details are, they lie outside the scope of the present paper. Among the ground forces, with the advent of more mobile warfare in 1940, when rigid lines became replaced by defended localities and maneuver again became possible, the possibility of using pigeons as a means of communication became questionable. They are obviously of greatest value to forward elements whose means of communication are slight. In such areas, telephone lines at first are flimsy and exposed to frequent interruption, and wireless is of short range and often hampered by atmospherics at night. The use of visual signalling and messengers is subject to interruption and expensive in personnel. *Caeteris paribus*, pigeon service could parallel or supplant such means of communication and, in the case of isolated parties cut off from the rest of the force, the birds could be dropped by parachute. Much work and ingenuity have been expended on this

subject by pigeon fanciers in the armed forces and their results are discussed below.

We may consider the several problems which have been met as follows:

1. Training pigeons for maximal mobility.
2. Training birds to fly at night.
3. Training birds for two-way communications.

*Problem 1.—Training birds for maximal mobility.*

Details of such training no doubt vary among the armies of different nations, but the following will serve as a representative example. Small lofts are used, either light enough to be manhandled or mounted on trailers. Young birds are chosen, usually about five weeks old, and are settled in these lofts. The initial part of their training consists of making the birds strong on the wing, "kitting" (*i. e.* flock formation) and teaching the birds to trap readily. Fundamentally the last mentioned is based on a simple conditioned reflex established through calling the birds into the loft by rattling feed in a can or blowing a whistle. Then, as soon as the birds pass through the trap, they are given their allowance of corn. Thus the birds come to associate certain sounds and the act of trapping with food. Immediate and automatic trapping is obviously of great importance when the recovery and delivery of a message in the shortest possible time are set at a premium. At this stage the lofts are moved short distances daily in order that the birds will not become irrevocably accustomed to any one spot. When strong on the wing they are packed in panniers and carried away short distances for release. Following this preliminary training, lofts are moved greater distances, up to 20 miles or more every three to seven days, and at each location the birds are given tosses in a direction set as the axis of advance. A limit of these tosses is tentatively placed at 50 miles. In cases where time of return is very long or some birds are lost altogether, earlier stages in the training must be retraced and repeated. Finally, the birds are released in pairs at suitable intervals so that they cannot kit together and message carriers are affixed to their legs so that they can become accustomed to wearing them.

The objects sought in such a training program are patent. Owing to the facility with which a bird localizes itself to any one place, the lofts are moved frequently to prevent the crystallization of such a fixation of association. There is no good reason for assuming that, as a result of such training, the bird's basic tendency to become absolutely attached to a given spot is weakened since a kit of such mobile-

trained birds, when established in any particular location for several weeks or months, are just as difficult to settle in a new locality as birds which have never been moved any time from a fixed loft. What it does accomplish is to prevent the development of a close association of loft with a particular locality. During the first day, preferably in late afternoon or evening, the birds are released for exercise. They fly about the loft area for ten or fifteen minutes and are then called in for food. On subsequent days they are given tosses at selected and increasing distances, *e. g.*, 1, 2, 5, 10, 15, 25 and 45 miles, respectively. These stages are always on some predetermined axis of advance. Tosses are given only in clear weather and during daylight. Visual training is obviously the only factor considered. In the initial flight the bird sees the topography of its immediate surroundings and establishes an association of home and food with those details of objects and spatial relationship which differentiate one spot from another. On subsequent tosses it gradually learns the surface features of the ground it will traverse, with each step in its training based on that which preceded it, and the greater the number of such flights, the faster does it home. Thus far the tale is simple, but it is necessary to analyze all those cases in which the bird fails to return or in which the time of return is abnormally long.

The first instance is that which is known among fanciers as a "fly-away." They say the birds are "flighty" and, casting a measured glance at the sky, note that the air is misty. Whatever terminology is employed, it remains a fact that birds, on occasion, when first released in a new locality, will fly about the loft for a short time and then gradually veer off and fail to return even though the loft is in full view, the birds are hungry, and the loftsmen to whose voice they are accustomed is calling them incessantly and rattling the feed can. Subsequently the birds may be found at the previous location of the loft, quietly feeding on the ground at the exact spot where the loft had been placed. They may visit several such old loft sites in turn and, if the loft has been moved many miles from the last position and the birds are in completely new country which they have never traversed before, they may disappear 'into the blue.' The factors operating here are complex but, in so far as they may be analyzed, the following seems to be the explanation. The loft represents to the bird food, water, a place to bathe, salt and grit of which it is inordinately fond, a place to roost (and each bird in the loft chooses its own particular perch) and finally protection. The potency of this last factor is seen in the reluctance with which the birds will enter the loft after it has been invaded by some predator, such as a cat or stoat. But the sight of the loft itself

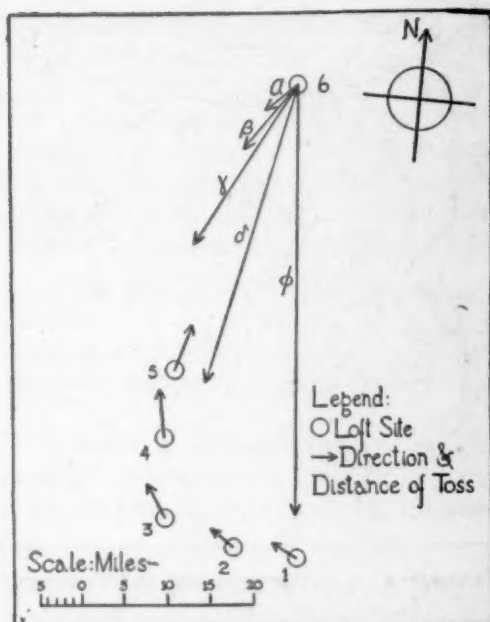


is not enough for the bird which, as the result of all its training, is accustomed to direct itself to the locality of the loft by the aid of certain visual landmarks and, when in the immediate vicinity of the loft, to its exact location by the peculiar topographical relationship of that spot to its surroundings. Therefore, no matter how strongly the conditioned reflex that signifies food may be established in its neural system, it may obey impulses correlating flight to visually known localities with food and fly off to some previously significant locality. The bird has seen little or nothing of its new location, only part of the panorama is true—the loft—and that is situated in false surroundings. To overcome this difficulty the following procedure has usually been found successful. The birds are kept enclosed for some time at the new location before they are released and they are permitted to view their surroundings either by turning the loft about regularly or by the use of an aviary; they are given a few grains of corn before release to correlate feeding with their new surroundings; and they are released late in the day when fading light discourages extensive flight, since the pigeon is essentially a diurnal bird.

Falling within a similar category are those cases in which the bird is required to fly over old flight routes. Although the bird may have been thoroughly trained over part of the new route and may have successfully homed on frequent occasions to its loft, yet, when tossed over areas which it has traversed on earlier occasions when its loft was differently situated than at present, it may descend and fail to return. Here again, latent memory predominates, reinforced by the presentation of visually known landmarks and divorced from the pull which would be exerted by the features of its true loft site, and the bird obeys the more immediate call. Figure 1 represents one of the several such cases which have come within the writer's ken. Movements of lofts are depicted numerically in the order in which they occurred; position 6 was reached approximately six weeks after position 1 was occupied. Tosses are shown by the length and direction of arrows. These were, in general, north until position 6 was reached. Here it became necessary to train birds south of the station to fly over route  $\phi$ . Tosses  $\alpha$ ,  $\beta$  and  $\gamma$  were successful but only 40 per cent of the birds returned from toss  $\delta$  and only two birds out of 30 from toss  $\phi$ , although the loft had been in position for three weeks before the last two tosses were essayed. Consequently, south of position 6 the result was a failure. It is apparent from this example that the use of pigeons in a withdrawal where they may be required to fly over old and disused flight routes may present insurmountable obstacles.

Of the additional factors, with the exception of natural and artificial





TEXT-FIGURE 1.—Training of birds over disused flight routes.

death-dealing agencies, which may hamper or prevent the bird's return, one other will be described which falls within the writer's experience—namely, character of the terrain. Civilian fliers are agreed that pigeons are reluctant to cross large bodies of water and hilly country and, in the latter case, tend rather to follow valleys and gaps in the hills. Therefore, when training birds to fly over rough terrain, the practice has been to toss birds at consecutive points which link up a flight route following valleys and gaps and which outflank hilly obstacles. Figure 2 gives an example of difficulties encountered in such training and a solution that was found. Contours above 400 feet are shown at 50-foot vertical intervals. L represents the position of the loft; points A, B, C, D, E and F, in that order, are points at which the birds were tossed. One hundred per cent return of birds tossed in good time was experienced from points A to D. Birds were very slow in returning and 10 to 15 per cent losses were encountered when they were released at points E and F. For the last two points successive tosses at D, E, F, G and H were substituted. In these cases the birds homed in good time and losses were negligible, one to two per cent. All experience in training the carrier pigeon emphasizes the important part which vision plays in its homing ability. In



TEXT-FIGURE 2.—Training of birds in hilly country.

the immediate case under discussion, irregular terrain delimited the vision of the bird. Tosses at E and F were relatively unsuccessful, and this may be ascribed to the hills and cliffs which lay across the birds' path. Yet on subsequent tosses, when points were followed along low ground linking water courses between hills and open country, much greater success was attained. The bird is balked by steep rises where surface features present sharp transitions and its flight consequently tends to become canalized along routes where the panorama displays inconsequential alteration.

*Problem 2.—Training birds to fly at night.*

Since the homing pigeon is essentially a diurnal bird it is very difficult to train as a night flier. Much evidence from competitive races shows that in long flights the pigeon will alight at dusk and continue its flight at dawn the next day. Such birds in cross-channel races have remained overnight on ships at sea; and times of return substantiate this hypothesis. However, certain British fanciers have recorded success in training their birds to fly in twilight in cases where their lofts were situated at distances greater than average from the point of release, and the time of flight might be expected to exceed the hours of daylight. Priestley (3) records that in the war of 1914 to 1918 successful experiments were carried out in the British Army on night flying. The birds were given tosses at increasingly greater distances

from the loft and the trap was illuminated with a lamp of low candle-power shielded from aerial observation. Similar work has been done in the present war. The loft is static; that is to say difficulties are so great in this form of training that it is not possible to move the birds at frequent intervals. The birds are given tosses from twilight on into dark at distances which increase up to a maximum of 20 miles. The birds take longer to return than by day. Of the several methods of training the following seem to have attained equal success:

1. Birds are kept by day in a darkened loft which is illuminated within after dark.
2. The loft is not darkened during the day nor illuminated at night and the birds are released during daylight for normal exercise flights.
3. The trap of the loft is illuminated with a weak light or the roof or side covered with a white marker. The writer's experience is that birds will trap more readily when the trap is illuminated at night.

*Problem 3.—Training pigeons for two-way service.*

Normally the pigeon will fly only over one direction of its route and must be carried to the point of release. Its homing propensity depends on the attraction of the loft and all that this structure represents. Within this loadstone the following factors may be differentiated: breeding, food, salt, grit, shelter, roosting, protection. The process of training pigeons to perform a two-way service consists of dividing these factors between two points. Breeding can be discounted since it is discouraged in army lofts. The birds are settled in a static loft, placed in baskets, carried away a short distance to a point within sight of the loft and fed in the basket. They are then released to fly home. This process is repeated and the birds learn to correlate the position of the basket with food. Gradually the basket is removed farther away until the desired delivery point is reached. At each stage the pigeons must be shown the position of the basket and be fed there. Then, on being released from the loft, they take a direct course to the basket to be fed. Their messages may then be removed and new ones placed in the container and on release they fly back to the loft. So stereotyped and unvarying is the pigeon's behavior that, in the early stages of this training, before they have learned to correlate the basket with food, they will not fly to it, although it is in full view of the loft and bears evidence of food, unless they are first carried to that position and fed there. This system of message carrying has given very good results; the birds behave faithfully and do excellent service, slightly slower on the homeward journey when they are

carrying one-sixteenth of their weight in corn. The chief disadvantage from the army point of view is that one point, the loft, must be static although the second point can be altered at will.

#### DISCUSSION

The descent of the modern homing pigeon from the wild rock-dove has already been mentioned and the arbitrary statement made that its homing ability is at least equal to that of the wild stock; it may even be conjectured that it has been augmented by selection, but of this there is no real proof. It is furthermore reasonable to postulate that the homing ability of the rock-dove and, *pari passu*, the homing pigeon, is, at least in part, of the same nature as that possessed by all migratory birds. For purposes of discussion the migratory achievements of birds may be distinguished as follows:

1. The initial flights of birds of the year to winter quarters which they have never seen before and over routes which they are traversing for the first time.
2. Second and successive flights of older birds to winter quarters and the return of all members of the species to summer breeding grounds.

It is obvious from the nature of its training and the character of its achievements that the homing pigeon will not assist in throwing light on the first problem. It is only within the limits of the second that a suitable comparison may be made. In both cases the birds are flying to localities which have been seen at least once before; in both cases flight is possible over routes which have been traversed at least once. The whole training of the pigeon is visual. The position of its loft becomes thoroughly known. In its exercise flights it traverses many miles of the surrounding terrain. Its tosses are gradually stepped up, mile upon mile, with each toss dovetailing that which preceded it, and with repetition the route becomes better known and the time of return is shortened. The birds become lost or will not fly at all under adverse visual conditions. When special training is undertaken to train birds to fly at night, such training must be done again in easy stages so that the birds are afforded the opportunity of learning such visual guides as may be apparent in dim light. And, in the latter case, the loft is treated so that it may more readily be seen in the darkness. The pigeon tends to follow low ground and valleys where vision is less restricted. Finally, when the bird is required to fly over both directions of the route, both termini must be known to the bird by detailed training.

Nothing in such training programs as the army employs or in the character of the flights required of the pigeon leads us to believe that any sense other than vision is employed by the bird in proceeding from point A to point B. Even negative evidence afforded by cases of no, or late, return emphasizes this conclusion as in the case of mobile-trained birds when the presentation of a choice between old and new flight routes and loft sites may lead the bird astray. This visual component of homing or migratory instinct—the memory of perceived localities—is the only component which need be evoked to explain the phenomena so far discussed and by the rule of economy of hypothesis it is reasonable to apply it to the second of these migratory flights of wild birds described in this section. In brief, migratory birds are guided by landmarks which they have previously seen when pursuing a course traversed on one or more earlier occasions. Suitable comparison may also be made with those numerous cases in which wild birds have been removed varying distances from their nesting sites and have successfully returned home. The destination of its flight, as in the case of the homing pigeon, can be recognized by the bird and in its previous wanderings it may have seen part of the route.

Recognition must now be given to cases of long-distance flights. In training for such races, tosses may be given up to 250 miles, but in the race itself, the bird may be taken many hundreds of miles and thus be released over territory which it has never encountered in its experience. Part of the route may even lie over featureless water. Losses are considerably greater in such long races and birds may be greatly delayed. Comparison may be made with the analagous case afforded by the experiments of Watson and Lashley (4) in which Noddy and Sooty Terns were removed from nesting sites on the Tortugas Islands in the Gulf of Mexico and carried for distances of more than 850 miles northward into areas in which these species are not normally found. These birds homed successfully over water and memory of landmarks could have played no part in accomplishing that flight.

In conclusion, it may be stated that the homing pigeon normally utilizes landmarks which it has seen before to guide it on its course. But it can also successfully home for long distances over routes which are strange to the bird. And in such cases so-called "inherited memory" can play no part since the route followed is selected arbitrarily by man.

#### SUMMARY

1. Carrier pigeons can be trained to fly to loft sites which are frequently changed at intervals of three to seven days.



2. They can be trained to fly short distances at night.
3. By placing the loft at one point and feeding the birds at another, carrier pigeons can be made to fly over both directions of a route.
4. The pigeon utilizes visual aids in its flight and all training emphasizes this factor.
5. Homing flights of pigeons may be compared to those migratory flights of wild birds which are proceeding to destinations previously visited over routes traversed on one or more earlier occasions.
6. In long-distance races, pigeons are released at considerable distances beyond the point of their last training toss and are consequently compelled to home over territory new to their experience. "Inherited memory" can play no part in such flights since the route, selected arbitrarily, bears no relation to the flight habits of its wild ancestry.

#### SOURCES

In the preparation of this paper the writer has drawn upon six-months' experience with the pigeon service in the Canadian Army, has watched the experiments carried out by British Army personnel, and has consulted the official instructions of the Canadian and British armies and the Royal Canadian Air Force. In addition, reference has been made to the following publications.

1. DARWIN, CHARLES  
1859. *The Origin of Species by Means of Natural Selection. The Variation of Animals and Plants under Domestication.*
2. OSMAN, LIEUT.-COL. A. H.  
— . *Pigeons in the Great War.* ("The Racing Pigeon" Publishing Co. Ltd., London.)
3. PRIESTLEY, R. E.  
1921. *The Signal Service in the European War of 1914 to 1918 (France).* (W. and J. MacKay and Co., Ltd., Chatham.)
4. WATSON, J. B., AND LASHLEY, K. S.  
1915. *Homing and Related Activities of Birds.* (Washington.)

*Second Canadian Corps Signals*  
*Canadian Army Overseas*

### GENERAL NOTES

A new form of *Agelaius* from Mona Island, Puerto Rico.—The following new race of *Agelaius xanthomus* from Mona Island, Puerto Rico, is described on the basis of material collected by the writer during the course of an investigation of the avifauna of this island. I propose that it be known as:

#### *Agelaius xanthomus monensis*, subsp. nov.

*Type*: Adult ♂, No. 887, collection Ventura Barnés, Jr., Mona Island, Puerto Rico, April 6, 1944, Ventura Barnés, Jr., collector. (Type presented to the United States National Museum.)

*Subspecific characters*: Similar to *Agelaius xanthomus xanthomus* (Sclater) of Puerto Rico, but with the lesser wing-coverts paler yellow, and the middle wing-coverts extensively or entirely white, or very pale yellowish white.

*Measurements*: Males (9 specimens)—wing, 102.2–106.4 mm. (104.4); tail, 77.0–84.4 (81.4); culmen from base, 20.7–22.8 (21.6); tarsus, 23.7–28.3 (25.9).

Females (4 specimens)—wing, 95.5–98.0 (96.4); tail, 73.4–77.6 (74.6); culmen from base, 19.7–20.1 (19.8); tarsus, 23.8–24.9 (24.6).

Type, male adult—wing, 104.6; tail, 81.8; culmen from base, 21.2; tarsus, 26.0.

There exist no differences in measurements between typical *xanthomus* and *monensis*.

*Geographic distribution*: Known only from Mona Island, in Mona Passage, 48 miles off the west coast of Puerto Rico.

*Material examined*: Thirty nine specimens of *Agelaius xanthomus* have been examined in the present study, 16 from Mona Island and 23 from Puerto Rico. For comparative purposes, fresh material of the typical race was collected from Cabo Rojo (8), the Lajas lowlands (10) and Guánica (5), all localities found in the extreme southwestern corner of the island.

*Discussion*: The subspecific characters in *Agelaius xanthomus monensis* are constant in all specimens examined with the exception of one immature female in which the tips of the middle wing-coverts are blackish instead of pure white as in other specimens. In one adult male the shoulder patches are entirely pure white without any trace of yellowish coloration in the upper wing-coverts.

In the juvenile of *Agelaius xanthomus xanthomus*, the yellow of the shoulder patches is lighter and often duller than in the adults; and the young are sometimes almost like fully adult individuals of *Agelaius xanthomus monensis*.

Some recent authors have placed *Agelaius xanthomus xanthomus* of Puerto Rico as a subspecies of *Agelaius humeralis* from Cuba. That these two are closely related there is no doubt though it may be pointed out that the bill in *humeralis* is different, having the culmen more broadened toward the base and slightly flattened as in *Agelaius phoeniceus*, while in *Agelaius xanthomus xanthomus* the culmen is narrower, with more of a rounded ridge. The tawny shoulder patches of *humeralis* and the yellow ones of *xanthomus*, while displaying related colors, at the same time are completely and definitively distinctive with no variation in which the two approach one another. Even the juvenile birds carry the same differences in coloration found in the adults, though the extent of the shoulder patches is much less. The females of both have shoulder patches smaller than in the males, but in *xanthomus* this sexual difference is slight while in *humeralis* it is considerable.

*Agelaius xanthomus xanthomus* of Puerto Rico is now found in the coastal littoral where it is abundant and well distributed. I presume that the new form *monensis* may have come originally from the main island to Mona, either in wanderings or through the force of some tropical storm. Due to geographical isolation after the bird adapted itself to the rocky, cactus-covered plateau of Mona, the color of the shoulder patches changed from the deep, rich, golden yellow color of the birds of the main island to the much lighter yellowish white or entirely white condition now characteristic of *monensis*.

I wish to acknowledge to Dr. Alexander Wetmore my sincere appreciation for the examination of my specimens and for his critical comments relating to them, some of which are included in this work. Let these lines convey to him my thanks for his kindness.—VENTURA BARNÉS, JR., *Division of Fisheries and Wildlife Conservation, Department of Agriculture and Commerce, Mayaguez, Puerto Rico.*

**A pale mutant Mourning Dove.**—On July 31, 1944, two fledgling nest-mates of the Mourning Dove were collected at Cuyahoga Falls, Ohio. The larger of the two was a male and of a very light color, while the smaller bird was typically dark and a female. Skins of both birds were prepared and are now in the collection of the American Museum of Natural History (A. M. N. H. nos. 308356 and 308357, respectively).

The wild parents of these specimens appeared to be quite normal. The mutant superficially resembles the juvenile stage of the domestic ring-dove in color, and the beak and claws were lighter than those of the normal sister. Closer inspection of the mutant reveals the characteristic Mourning Dove color pattern; each spot or band which, in the normal, is black is represented here by a drab facsimile. The effect is somewhat similar to that of the "dominant opal" color factor found in certain strains of domestic pigeons.

We have found no other report of a similar color mutant in this species, and no similar specimen exists in the collection of the American Museum. A light-colored example of *Zenaida aurita* from Cuba (A. M. N. H. no. 690) somewhat resembles it, but is darker.

We are indebted to Dr. Ernst Mayr for helpful comments and to Mrs. Guinevere C. Smith for assistance in preserving the skins.—C. F. GRAEFE AND W. F. HOLLANDER, *Cold Spring Harbor, Long Island, New York.*

**Red-eyed Vireo with vocal defect.**—On June 15, 1942, in a low, tamarack-bordered, deciduous woodlot at Rose Lake Wildlife Experiment Station, near East Lansing, Michigan, I heard a strange, wheezy song consisting of two or three frequently repeated husky whispers. Though the jerky, unmusical notes suggested an *Empidonax* flycatcher, the song was so unlike that of the more familiar Michigan members of that genus that a detour was taken through the woods in anticipation of discovering something unusual. A tree-top view of the singer disclosed a vireo-like bird, with distinctly vireo-like feeding and singing habits, thus putting the new flycatcher theory completely at rest.

A check-up the following morning, with 8× binoculars, found the bird still present, still singing its peculiar husky song. A fairly satisfactory view of the singer disclosed what appeared to be a Warbling Vireo, flaunting a conspicuous white feather in the position of the upper tail coverts; but the song, broken up into choppy notes, uttered in a series of two's and three's, was totally unlike the continuous song of that species.

Still dissatisfied, I returned on the third morning in company with a member of the Rose Lake Station staff, who collected the specimen. On examination it proved

to be a more or less typical Red-eyed Vireo (*Vireo olivaceus*), with the characteristic red iris, with possibly less distinct head markings than usual in the adult vireo, and with one white feather protruding from the rump. Subsequent comparison of the specimen with skins in the University of Michigan Museum of Zoology at Ann Arbor, failed to verify the previous impression that the head markings were a little obscure. The bird was apparently a normally plumaged male with well-developed,  $8 \times 5$  mm. testes, and the conspicuous white feather, rather than indicating albinism, seemed to be a normally colored under tail covert that had slipped through the rectrices to occupy a dorsal position. The specimen is in the Rose Lake Wildlife Experiment Station's modest collection of birds.

Thus on three consecutive days in mid-June, this bird was noted singing its peculiar, abrupt and husky, flycatcher-like song (at times the notes were suspiciously suggestive of the familiar *chebec* of the Least Flycatcher). Once the identity of the bird was definitely established by collecting, however, it was realized that the sequence of phrases was not unlike that of a Red-eyed Vireo, but that the quality and pitch were so far off that the song had not been recognized. At times the bird could be seen trying to sing, with its throat vibrating, but with only faint, barely audible, wheezy sounds coming forth. Then, with further efforts, louder notes would be produced, occasionally becoming suggestive of a vireo but quickly relapsing into a hoarse whisper, as of a bird with a very sore throat. The bird had not previously been noted during occasional trips in that vicinity in May and early June, so whether it had merely escaped notice earlier, was a newcomer, or had suddenly developed a throat defect affecting its song, was not known. Though it was apparently not the only Red-eyed Vireo in the woods, it was not determined whether or not this bird had a mate.—GEORGE J. WALLACE, *Department of Zoology, Michigan State College, East Lansing, Michigan.*

**Autumnal duelling among Mockingbirds.**—For ten minutes shortly after sunset on the evening of October 1, 1944, near a small lake on the AAF Tactical Center's 'New Area,' at Orlando, Orange County, Florida, Major Henry I. Baldwin and I watched two Mockingbirds (*Mimus polyglottos*) in what appeared to be a sort of border-dispute. When we first saw the birds they were facing each other, about a foot apart, on close-clipped lawn not far from the foot of a large tree. There was no shrubbery close by, hence the dispute could hardly have arisen over food-supply, roosting place, or the preceding summer's nest-territories. Their heads and tails were lifted high, their wings dropped. They looked at each other as if bent on fierce combat, but when one started to lunge, the other side-stepped, or side-hopped, shifting the bout several inches to right or left. Thus moving back and forth along a 'battle-front' about four feet long, they continued to feint without once (a) actually lunging full-tilt at each other; (b) scratching or pecking each other or striking out with their wings; (c) uttering any sort of cry of threat or warning. Both birds appeared to be in excellent feather and general condition. Three times during the ten-minute period one bird or the other lost interest momentarily, hopping back from the 'battle-front'; but the other gave quick pursuit with wide-spread wings and tail, and instantly both returned to their original positions and the feinting began again.

A third Mockingbird scolded occasionally from a live oak tree about 30 feet away but did not interest itself in the duel so far as I could see. In the distance several Mockingbirds sang intermittently. The passing of an automobile broke up the encounter.—GEORGE MIKESCH SUTTON, *Major, Air Corps, AAF Tactical Center, Orlando, Florida.*



**How many times does a Song Sparrow sing one song?**—On my arrival at Duneside Inn, Chesterton, Indiana, June 24, 1944, I found a male *Melospiza melodia* that had not been present on my earlier visit in late May. This bird was unmated and sang persistently in the vicinity of my cottage. Some of his songs were striking and it was soon evident that he changed from one to another more frequently than had the two Song Sparrows that I had studied most in Ohio. Hoping to find in this singer a bird with a larger repertoire than I had observed before, I learned his songs by heart, discovering that he had ten (only one more than 4M, one of my Ohio birds). I got a full record of all songs for four hours (12:50–4:50 C. S. T.) on the afternoon of June 27 and for half an hour (8:52–9:22) on the morning of June 29; records of the series given were obtained from 4:45–5:45 a. m. on June 27 and 8–9 a. m. on June 28.

The four afternoon hours compare well with the "uninhibited singing" of the Ohio birds as shown in Table XIII (Nice, M. M., Trans. Linnaean Soc. N. Y., 6: 121, 1943); there were 122 songs in 19 series, an average of 4.8 series per hour, 6.7 songs per series, and 30 songs an hour. The three morning records, however, showed that his "highly stimulated" singing differed from that of 1M, 4M and 10M, that averaged 11.5 series per hour; for on June 27 there were 21 series in the hour and the next day 20 series, with 10 series in the half hour on the third morning. This pattern resembles that of 187M that averaged 20.5 series in four hours in March, 1934. (I did not get a chance to check this bird later as he disappeared in early April; I thought the shortness of his series might be due to his youth for he was less than a year old.)

As to length of series, on June 27, ten series of the Indiana male averaged 9.2 songs, and ten on the 29th, 11.2 songs, in contrast to the three Ohio birds of Table XIII that averaged 20.5 songs per series in the highly stimulated state. On June 29, the whole repertoire of ten songs was gone through in the half hour, but the day before four songs were repeated before the repertoire was completed. The longest series on June 27 reached 18 songs; on June 29, 23 songs. The longest series I ever recorded from 1M was 58 songs; from 4M, 72. When singing steadily the Indiana bird averaged four songs a minute; the Ohio birds averaged about five. Two of the Indiana songs had two versions; one varied in the middle portion, one in the last. It is clear that with this bird each song held the field for a shorter period than had been true with three of four birds in Ohio—some three minutes in the highly stimulated state with the former, five with the latter. This is an easy matter to check when a Song Sparrow is singing steadily; an hour's observation will give the total number of songs and the number of series, since the change from one song to another is striking.

May I call attention to two errors in the above-mentioned Table XIII? In lines 3 and 4, the four instances of "songs per hour" should be omitted; in the last two columns, "6 231" (directly under "34 20.5") should be omitted. Another error which calls for correction occurs in Table V on p. 70; "Group V" should be inserted above "Alaudidae."—MARGARET M. NICE, *Chicago, Ill.*

**Cowbirds anting.**—At 6:30 a. m. C. S. T., June 28, 1944, I was watching two *Molothrus ater* feeding on the lawn at Duneside Inn, Chesterton, Indiana, when I noticed the female holding her wings out from her body and apparently preening them. Suddenly I realized that for the first time I was witnessing anting by a wild bird. Quickly and unobtrusively she ran her bill along the outer primary of first one wing, then the other, but her tail was not drawn forward as in typical anting, as seen in Ivor's birds (*Auk* 60: 51–55, 1943) and in my Song Sparrows and Bobolink. After going through this performance some half-dozen times in different places in an



area of perhaps two square yards, she walked into taller grass, whereupon the male anted in the same casual manner and for about the same number of times. The birds flew off and I examined the ground, finding many small hills of *Lasius niger* and several individuals of the genus *Formica*.

Ivor (1943) reports the Cowbird as not anting. In answer to inquiries, he writes me that this has been true of an adult female three seasons in succession and of a young male and female tested when 32, 35, and 41-43 days of age; however, the male anted once with specimens of *Tapinoma* sp.? when 46 days old. The failure of his adult bird to ant in the aviary, and the mild manner in which the two individuals I watched performed in the wild, would seem to show that the tendency to ant is weak in *Molothrus ater*. The inconspicuous way in which anting was carried out in this instance makes me wonder whether this behavior may not be more common than is generally supposed; I would not have recognized it had I not previously seen it executed in extreme form by hand-raised birds.—MARGARET M. NICE, Chicago, Ill.

**Fall migration of the Golden Plover at Fort William, Ontario.**—The Golden Plover (*Pluvialis dominica dominica*) is a regular, but uncommon, autumn migrant at Whitefish Lake, 50 miles southwest of Fort William, where individual birds are occasionally seen during late September and October. Such observations are not unusual, but we were surprised to see 25 of these birds feeding in low, wet fields in Paipoonge Township, eight miles west of Fort William, on October 10, 1941. Only an occasional plover was seen at Whitefish Lake during the fall of 1942, but in 1943, it appeared in large numbers west of the lake-head city. Twelve were noted on September 23 in the same region where they appeared in 1941. On the morning of September 26, a flock flew over the outskirts of the city and that afternoon Golden Plovers were feeding in low fields, cleared of hay and grain, along both sides of the Trans-Canada Highway for about six miles, not only within the city limits but also in the municipalities of Neebing and Paipoonge.

It was difficult to determine how far their invasion extended back from the highway but we conservatively estimated their number at 1000. They were equally common on September 30 but their number had decreased by October 3, when we collected an adult female, now in the Ontario Museum of Zoology, No. 68756. They gradually decreased until October 26, the last date on which they were noted, when only 12 were present. During October they had been such a conspicuous feature that several inquiries came in as to the identity of the "ploverlike birds" so abundant in the region.

The present concept of the autumn migration of the American Golden Plover has been well summarized by Roberts ('Birds of Minnesota,' 2nd ed.: 466-470, 1936). He says: "The main fall migration is first eastwards to Labrador and Newfoundland, thence south to South America, across the ocean . . . a few, formerly many, passed south in the fall, through the Mississippi Valley." In recent years, Roberts reports a slight increase in their numbers during fall migration; adult birds, singly or in small parties, precede later flocks of juveniles. The birds noted at Fort William were undoubtedly following the interior route and probably originated north of Hudson's Bay.—A. E. ALLIN, Fort William, Ontario.

**Wettable water birds.**—That cormorants and anhingas have many peculiarities in common is evident from accounts of their characteristics and relationships. One point that seems to have received little public notice is that, although highly aquatic in habits, these birds have plumage that is not very water-resistant but which in the course of their under-water activities becomes thoroughly wet. This wetting fre-

quently proceeds so far that the birds are unable to fly and must crawl up on a perch where they can dry.

In the case of the anhinga, well-grown young, but largely in the natal down and still flightless, may leave their nests and climb to the tops of their nesting trees when disturbed by man. If further pressed, they plummet downward and swim rapidly away—a strange sight in crystal-clear water. Emerging, they climb on some snag in the vicinity, where their parents feed them until they are able to fend for themselves.

Extended field observations of both birds under a wide variety of conditions indicate that where rough fish and other acceptable aquatic animals are ordinarily plentiful, comparatively little time in and under water is required to satisfy their demands for food, even when there are hungry young to care for. This indicates extraordinary ability in the pursuit of prey, and precludes the idea that these birds are handicapped by the lack of impervious plumage. Their great fishing skill earns them much leisure and for hours on end they sun, preen, and stretch on the dead trees and other perches in the vicinity of their fishing grounds.

This getting bedraggled would appear to be a hiatus in their adaptation to aquatic life, which in various other respects seems so complete. Both groups have oil glands, but possession of those organs evidently is not the whole secret of the resistance of plumage to water. Most aquatic fowl, after submerging, pop to the surface where the little water they carry with them immediately rolls off; normally they are practically unwettable. Most of these birds spend far more time in water than do the subjects of this sketch. The wettability of the cormorants and anhingas may indicate an even closer relationship between these groups than is currently admitted, one that possibly entitles them to rank as a suborder of the Steganopodes. Their obvious and great differences, however, inform us in this, as in so many other instances, that we are dealing with far-evolved entities—tip of twigs of the tree of life, of which the branches connecting them with the main trunk have been lost in the chaos of things that were.—W. L. MCATEE AND HERBERT L. STODDARD. Chicago, Illinois, and Thomasville, Georgia.

**Color change in *Ramphocelus flammigerus*.**—In December, 1941, the Chicago Zoological Park at Brookfield, Illinois, received two pairs of tanagers from a dealer in New York. One pair was called "Scarlet-rumped Tanager" and the other, "Orange-rumped Tanager." The male of the former was velvety black with light scarlet rump; that of the other was black with the under parts sparingly marked with traces of the yellow color of immaturity, while the rump was light orange yellow. The two females were very much alike, with blackish head and upper parts, bright orange yellow rump, orange band across the chest, and light yellow belly. We identified all four birds as *Ramphocelus flammigerus*, the Variable Tanager.

After a few months, the scarlet-rumped male and one of the females died, but the other two birds survived and eventually molted. In this molt, the male lost all traces of the yellow feathering on the under parts and acquired a much deeper color on the rump, comparable to Flame Scarlet in Ridgway's 'Color Standards and Color Nomenclature.' Now, over two years later, it still has this area decidedly vermilion.

It thus appears that at least some of the variability in the color of the rump of males of this species is due to the different ages of the individuals.—KARL PLATH, Chicago, Illinois.

**Whip-poor-will endurance.**—The Eastern Whip-poor-will (*Antrostomus vociferus vociferus*) is a regular and locally numerous breeding species on Staten Island

(which for nearly fifty years has been incorporated in the Greater City of New York), although Cruickshank in his "Birds Around New York City" (1942) excludes the Whip-poor-will from the greater city as a breeder, and Griscom did the same in his earlier (1923) "Birds of the New York City Region." One of the half-dozen or more localities on Staten Island where Whip-poor-wills can be heard in numbers throughout the breeding season is the sparsely settled, wooded and second-growth area to the north and northwest of our home in Pleasant Plains. From our bedroom window I have often heard the clearly articulated call which Staten Island's late much beloved 'all-round' naturalist, William T. Davis, rightly contended sounds more like "purple rib" than "whip-poor-will."

On the night of June 1, 1944, I was lying awake in bed at about midnight when a Whip-poor-will began broadcasting from one of his favorite stations about a hundred yards from our house. He had uttered an estimated 300 calls when it occurred to me to start counting. Doubling up my right fist, I opened out my thumb at the first hundred, my index finger at two hundred, and so on. When my right digits were exhausted I started with my left. I was wondering whether I had fingers enough when the bird quit with the score at 779. Add the estimated first 300, and the grand total for that one uninterrupted run is more than 1000 "purple ribs" delivered at the even rate of almost exactly one per second. This adds up to a little more than sixteen minutes of sustained effort. Whatever the Whip-poor-will says, he says a lot of it. The listener, not the performer, becomes subject to exhaustion. I got out of bed and set down the figures on paper lest I become uncertain of them by morning.

At 11 p. m. on June 2, a Whip-poor-will, presumably the same male, called from the same station, but his high score was only 450 calls. He seemed to be 'slipping.' However, on the night of June 4 he was in good form, running up a tally of 711. It should be explained that scoring was on the basis of uninterrupted performance; a pause of as much as five seconds disqualified the additions.

Moonlight unquestionably exerts a stimulating influence on Whip-poor-wills. On dark nights, even during the height of the nuptial period, birds may call for less than an hour, beginning at deep dusk, resuming shortly before dawn. On clear, moonlit nights the resounding cry of "purple rib" can be heard all night long. It is noteworthy that the moon was at first quarter on May 29 and at the full on June 6, 1944, between which dates the peak vocal performances cited were achieved. By mid-August, or earlier, Whip-poor-wills are silent except for a few outbursts just before daybreak. August 10, a Whip-poor-will was heard in early morning, but his recital consisted merely of seven calls, three followed by a pause, then four. Even in August and September, a bright, full moon will, to some extent, revive the urge to sing.

Near our home stands the large stone building of the St. Louis Academy, the walls of which produce almost perfect echoes. Hammer blows originating in our yard come back in echo with almost startling clearness. The calls of the Whip-poor-will rebound with equal fidelity. I cannot prove it but I think the birds have, at times, been deceived by these sound effects. I have heard a Whip-poor-will increase his tempo, whereupon the echo was correspondingly accelerated, and the bird speeded up still further until his sound apparatus 'jammed' completely. I have wondered if this Whip-poor-will might not return to this echoing post in challenging mood, as cardinals robins, orioles, and other birds have been observed repeatedly to hurl themselves against windowpanes in seeming duels with their own reflections.—HOWARD CLEAVES, 8 Maretzek Court, Staten Island 9, New York.

**The food of the Raven in Virginia.**—For some years a pair of ravens has nested near Lexington, Virginia, alternating between two high cliffs on the same mountain. This year, while there were still eggs in the 1944 nest, I gathered a handful of bone fragments from a small area immediately beneath each nesting site. Mr. A. L. Nelson of the Economic Investigations Laboratory of the Fish and Wildlife Service was kind enough to examine the material. In the debris collected at the 1942 nesting site he reports the following items: "10 flying squirrels; 1 Norway rat; 1 gray squirrel, adult; 1 squirrel, probably a young gray squirrel; 1 mourning dove; 1 unidentified bird, about the size of a jay; 1 colubrine snake; 1 *Polygyra* snail; short-horned grasshoppers." In the 1943 material he found the following: "6 flying squirrels; 1 grouse; 1 unidentified bird, about the size of a jay; 1 snail, probably *Polygyra*." Since broken snail shells occur everywhere on the mountain sides I am inclined to think that the *Polygyra* fragments should be disregarded. The rest of the material seems likely to have come from food brought to the young ravens. It would be interesting to know how many of these animals were killed by the ravens and how many were found dead.—J. J. MURRAY, *Lexington, Virginia*.

**Middle 19th-Century introduction of British birds to Long Island, N. Y.**—Information on this somewhat obscure subject has been found in a book not likely to be listed in ornithological bibliographies. It is 'Green-Wood Cemetery: a History of the Institution from 1838 to 1864,' by Nehemiah Cleaveland, New York, 1866. The data are on pages 73 and 134.

Toward the end of 1852, the trustees of the cemetery purchased 168 British birds, through the agency of Mr. Thomas S. Woodcock, of Manchester, and freed them in Green-Wood. There were 48 skylarks, 24 wood larks, 48 goldfinches, 24 robins, 12 thrushes, and 12 blackbirds. The birds were purchased at an average price of eight-pence, and the entire importation cost slightly over \$100.00.

According to the author, the experiment was a failure because the freed birds all disappeared. It is worthy of note, however, that skylarks maintained for many years a representation on farmlands in the outskirts of Brooklyn, and that European goldfinches still persist in the more distant vicinity of Seaford and Massapequa.—R. C. MURPHY, *American Museum of Natural History, New York*.

**Cotton Mather's manuscript references to the Passenger Pigeon.**—In the October issue of the *Auk* (61: 587–592, 1944) presumably all that Cotton Mather published concerning the Passenger Pigeon was reprinted and discussed. Nothing was said of the additional information contained in three of his letters, sent to Dr. John Woodward for presentation to the Royal Society. They are among those admirably studied by Professor George L. Kittredge (Cotton Mather's Scientific Communications to the Royal Society. *Proc. Amer. Antiq. Soc.*, N. S. 26: 18–57, 1916). Complete copies of the second of these letters, written probably in June, 1714, and the third, dated July 4, 1716, have since been made readily available by Dr. Arlie W. Schorger (Unpublished manuscripts by Cotton Mather on the Passenger Pigeon. *Auk*, 55: 471–477, 1938). Between the two (in 1715) "in lieu of his usual series of letters," Mather sent to England the manuscript of 'The Christian Philosopher,' printed in 1720, but postdated 1721 (Kittredge). That book includes everything of importance in regard to pigeons that is contained in the two letters except—as rightly stressed by Dr. Schorger—the source of his information. It was from the Indians that Captain Billings learned that what the pigeons disgorged for their young was "nothing they had eaten, but something that came naturally into their crops, as milk." In fact, all the best that Mather published about pigeons was transcribed



from a letter given him by his friend, Captain Billings, which he is careful to quote and acknowledge in the second of the letters (Schorger, p. 474).

The first of Mather's letters to contain a record of the pigeons remains unpublished. The original, addressed to Dr. Woodward, Nov. 19, 1712, is in the Letter-Book of the Royal Society; but the Massachusetts Historical Society has a complete copy—the "Gay MS., fols. 39-47." It was used by Professor Kittredge, but apparently was overlooked by Dr. Schorger, so that, to complete the publication in the Auk of all that Mather wrote about the Passenger Pigeon, the following excerpt from the first letter is needed. After some comments on our Humming-Birds, weighing "but eight or Ten grains," and still referring to them, the letter continues:—

"They are never seen in the Winter, but are some of the *Season-birds*, whereof I now propose to invite you unto an entertainment. And so are o' wild Pigeons whereof Thousands of Millions visit us at their appointed *Season*. The flights have been so great, that for four, or five miles together, they have meerly darkened the Horizon. They have been Commonly sold in y<sup>e</sup> markett-place, ready pluck'd, & drawn, for two-pence or three-pence a dozen; enough to make a meal for half a dozen temperate people. We take y<sup>m</sup> either w<sup>th</sup> *Gun* or with *Nett*, it is hardly credible, how many at a time. Their Numbers are of late years much diminished; especially on this occasion. When y<sup>e</sup> time of their Departure has been at hand, about *Michaelmas*, they have in horrible storms miss'd their way; & thousands of Millions have perished in the sea, where o' Ships have afterward sailed thro' them lying on y<sup>e</sup> Surface of y<sup>e</sup> Water, for some Leagues together. Tis odd, that tho' we have such Vast Numbers of them, yett in *Virginia*, a Colony a Little to the Southward of us, I am told they are somewhat of a Rarity; which will a little fortify a Conjecture about the *Season-birds*, which I am now going to tender you."

The long letter then speculates on possible "*Christalline*, or *Semi-pellucid* Bodies, between the *Earth* and the *Moon*," to which migratory birds may resort; or else, as stated in the second letter, the pigeons "must have a Retreat in South-west parts of *America*, whereof we are not yett advised." The Royal Society was doubtless "entertained." Dr. Woodward asked for, and received, more information about the pigeons since, as Professor Kittredge observes, "no historical student would think of denying that Cotton Mather was one of the best informed Americans of his time in scientific matters."—FREDERIC T. LEWIS, *Harvard Medical School, Boston*.

**Ornithological corrections.**—The series of corrections in the July, 1944, Auk by Mr. W. L. McAtee sets a fine precedent, but it hardly seems necessary to wait scores of years. From time to time we all run across errors in our own published writings. I shall here correct those in my own which seem to change meanings. In only one of these papers did I see proof.

1934. Auk, 51: 304, line 18. The numeral 2 should be the letter *a*.

1935. Trans. 21st American Game Conf.: 34. The printer put in "casual" where I wrote "causal". There is a lot of difference between the two.

1939. Research Studies State Col. Wash., 7: 163-198. Page 170, number 15a should be *tree swallow*; page 172, number 4d should be *black-throated blue warbler*. In a revision of a rough draft some years earlier, a comparison between the Green-winged and Blue-winged Teals was dropped. In some way, the scientific name of the former became attached to the latter. Obviously it should be *Querquedula discors* on page 174.

1942. Passenger Pigeon, 4: 78-79. I do not know how the American Oyster-catcher got into Table 3. It is not in my data.—LEONARD WING, *State College of Washington, Pullman, Washington*.



**Ptilology**—a proposed name for the general study of the plumage of birds.—In 1867, the Ray Society, of London, published in its 'Transactions' a translation of the first important treatise on feathers—the work of the German ornithologist, C. L. Nitzsch. It was entitled "Pterylography" and dealt primarily with the pterylae or feather tracts of birds, although it also included a brief but good description of the general structure of feathers.

Nitzsch's work has been followed by many other papers, which have dealt with the structure and color and the taxonomic characters of feathers, as well as numerous peculiar adaptations. Much of this research has been based on the examination of feather structures under the microscope and has been progressively more thorough, but the published literature on the subject is still discouragingly meager.

Men engaged in serious study in a virgin scientific field should logically have in common a name descriptive of that field, but this has not been true of those doing research work on feathers.

Nitzsch's name, 'pterylography,' applies to the study or description of the feather tracts, the pterylae; and another term, 'pterylogy,' deals with the study of the arrangement of the feather tracts. Neither term is sufficiently inclusive to describe the general study of the plumage of birds.

In my work with the former Bureau of Biological Survey, now the Fish and Wildlife Service, and subsequently, I have found a special need for a term descriptive of my restricted field, the comparative study of microscopic feather structure as it pertains to the identification of fragments from the stomachs of animals.

This need has become pressing, and I hereby propose two terms, which are descriptive of the general field and my special branch. These terms may be defined as follows:

pti-lol'o-gy (tī lōl ō jī), n. [*ptilon* down, a feather, a wing + *logy* science of.]

Zool. The study of ptilosis, a term meaning the plumage of birds, irrespective of pterylosis.

mi-crop-ti-lol'o-gy (mī crōp tī lōl ō jī), n. [*mikros* small + *ptilon* + *logy*.] Zool.

The study of feather structure not visible to the unaided eye.

The definitions of pterylography, pterylogy, pterylosis, and ptilosis, as they are given in Webster's dictionary, 2nd edition, unabridged, have been accepted as standard in the formulation of the two definitions given above.—FRANKLIN H. MAY, 210 Spruce Avenue, Takoma Park, Maryland.

**Sinaloa Martin nesting in western Mexico.**—In an article entitled 'Unusual Birds and Extensions of Ranges in Sonora, Sinaloa and Chihuahua, Mexico' (Condor, 50, No. 1: 23, Jan.-Feb., 1938), the author recorded the collecting at San Feliz, Chihuahua, of the first females of this rare martin, which had been known previously only from the topotypical series reported by Nelson (Proc. Biol. Soc. Wash., 12: 59, Mar. 24, 1898) from "Plomosas," Sinaloa, at a slightly lower altitude. There also are two specimens from La Laja, Jalisco, intermediate in their characters, but nearer *sinaloae*. The collector, Chester C. Lamb, had reason to believe that the San Feliz birds represented a nesting colony, and recorded in his journal: "Quite a colony are nesting in some hole in the sycamores." However, this was not factual evidence to prove the breeding, an assumption that has been gravely doubted by several authorities. There was good ground for the belief that this far western form, dependent for its validity on smaller size, entirely white under tail-coverts, and black tips to feathers of dorsal surface, according to the describer, represented an

accidental occurrence of true *dominicensis*, whose breeding range is confined to the Greater and Lesser Antilles.

An excellent new series of ten males and four females, secured by Mr. Lamb between June 9 and June 30 at a collecting station, "ten miles northwest of Santa Teresa, Nayarit, at 5500 feet altitude," has now solved the problem referred to by Hellmayr (Cat. Birds of the Americas, 13, pt. 8: 16, 1935). On June 9, Mr. Lamb secured a male, one of three "flying about a tall dead pine." On June 11, he secured another male and recorded in his journal: "I saw martins entering a hole in a large white oak thirty feet up." Others were collected on the 17th, 20th and 30th, including four females, and the two females taken on the 17th had eggs in the oviduct. Every one of the ten males had the sex organs fully enlarged. In conversation, Mr. Lamb stated emphatically: "There was unquestionably a colony of these martins nesting," and the fact that there were eggs in the oviducts of the females proves his statement. Apparently, he did not have proper climbing equipment to make the ascent to the holes. The general area consisted of high ridges covered with pines and "some white oaks," which indicate the Transition Zone. The topotypical series was secured at a somewhat lower altitude about 50 miles to the north and, since our previous series of six specimens was taken at San Feliz, Chihuahua, in the same main Sierra Madre de Occidental at an altitude of 7500 feet, there is no question but what this is a high altitude form.

The Sinaloa Martin is definitely a subspecies of *Progne dominicensis* and should be known as *Progne dominicensis sinaloae* (Nelson). It is unquestionably very close to *dominicensis*. However, I feel that it should be recognized on the basis of: (1) its smaller average size [the ten Santa Teresa males have an average wing length of 135.7 mm. (131.8-141.7) as compared with the average of twenty-two specimens of true *dominicensis* of 143.5 mm. (134.0-149.0) as given by Ridgway]; (2) the usually more expansive white areas of the under parts; and in the males, (3) the pure white under tail-coverts which, in none of my ten specimens, have any "dusky gray" in them, characteristic of many males of true *dominicensis*. Consideration also should be given to the enormous gap between the ranges of the two forms, since no specimen has been recorded from central and eastern Mexico, a stretch of country more than one thousand miles in width, *i. e.*, from La Laja in northern Jalisco to the east coast of Yucatan. Nor has either form been taken in the westernmost islands of the West Indies—Cuba or the smaller islands west of Jamaica. Lastly, the zonal and altitude preferences seem to be different in the two birds.—ROBERT T. MOORE, *Contribution of the California Institute of Technology, Pasadena, California.*

**White-fronted Goose in Connecticut.**—On November 5, 1943, Mr. Edward L. Mulliken of Saybrook, Connecticut, and party were duck hunting off Westbrook when three geese approached from the northwest, flying out from shore. Responding promptly to an imitation of the Canada Goose call, all were taken. They proved to be White-fronted Geese, *Anser albifrons*, and were so reported to the National Headquarters of Ducks Unlimited in New York. Mr. Ray E. Benson of that organization writes that, with the possible exception of an immature bird taken in 1941 off Sachem's Head by Joseph Dolin, but unfortunately not positively determined before disposal, these birds are believed to constitute the first of this species recorded from Connecticut.

Mr. Mulliken kindly sent them to the Peabody Museum for study, and a search through the files of 'The Auk' confirmed Mr. Benson's belief. The records, however, show that specimens have been taken on the Atlantic coast as follows: Massachusetts, two in 1866, two in 1888, one in 1897, one in 1926; Long Island, one in 1846, 1849,

1872, 1889; New Jersey, one in 1926; Virginia, two in 1925, one in 1940; North Carolina, one in 1897, 1923; South Carolina, six before 1910 (Wayne), one in 1920, 1926, 1927.

Painesville, Ohio, was visited by a flock of 42 on March 30, 1930, notable as possibly the only eastern spring record. In view of Mr. Benson's statement that several White-fronted Geese were shot in the Lake Champlain section of New York a few days before the Connecticut specimens were bagged, and the fact that the latter came down from the northwest, one may indulge in the speculation that these three birds constituted a remnant of the Champlain flock.

The group consists of a male and two females, all immature. Beyond the interest attaching to representatives of a western species, rarely encountered in the east, lies the question of the subspecies to which these three specimens should be referred. The fact that they are in the immature plumage, and hence not yet fully grown, renders this determination less easy. The measurements in millimeters and certain characters follow:

No.	sex	length	wing	culmen	tarsus	weight	eyelids	
13521	♂	698	410	55	72	4 lbs. 12 oz.	yellow	16 rectrices
13734	♀	682	402	49	71	4 lbs.	yellow	16 rectrices
13735	♀	666	398	51	69	4 lbs. 2 oz.	yellow brown	16 rectrices

Measurements, weights, and number of rectrices in the male suggest the common American White-fronted Goose, *A. albifrons albifrons* (Scopoli). The brown eyelids of 13735 are also characteristic of this race, but those of 13521 and 13734 are yellow as in the larger Tule Goose, *A. a. gambelli* Hartlaub recognized by Swarth and Bryant (Univ. of Calif. Publ. in Zool., 17, no. 11: 209-222, 1917). Dr. Louis B. Bishop writes that the color of the soft parts is of doubtful value in distinguishing these two subspecies. It may be noted that the length of culmen in the male falls within the range given by Swarth and Bryant for *gambelli*. As for the tail-feathers, no statement has been found concerning the plumage in which the male Tule Goose first acquires the ninth pair present in the adult.

On the whole, these Westbrook geese would seem to be common White-fronts. The likelihood that a few of these should stray southeastward during migration is greater than for *gambelli* whose numbers and wintering grounds are much smaller.

Comparison of these skins with a large series should prove interesting. Probably such are available only in California.—STANLEY C. BALL, Peabody Museum, Yale University, New Haven, Connecticut.

**Additional breeding and migration records of the Black-backed Robin.**—In view of the recent extension of the known breeding range of *Turdus migratorius nigriceus* across the Straits of Belle Isle from Newfoundland to the coast of Labrador (Peters and Burleigh, Auk, 61: 472, 1944) it would seem to be of interest to put on record additional material that has recently come to my attention. In the United States National Museum there are two adult male breeding specimens from Chimo, northern Quebec. These birds, taken by L. M. Turner on May 27 and June 8, 1884, are almost typical *nigriceus* and extend the breeding range of the Black-backed Robin considerably to the northwest. This discovery makes less surprising the occurrence of migrants from as far west as Illinois and Michigan.

Unreported migrant specimens of this race of the American robin have been identified in the collections of the American Museum of Natural History and the United States National Museum (including the Biological Survey Collection). These are:<sup>1</sup> CONNECTICUT, (A) Danbury, April 13, 1907; ILLINOIS, (N) Mount Carmel, October 18, —; NEW JERSEY (A) (northern), March 6, 1886; NEW YORK, (A) Long Island, November, 1903, (A) Manhattanville, January, 1846, (A) Shelter Island, December 15, 1903, and (A) Syracuse, April 21, 1887; NORTH CAROLINA, (N) Asheville, February 16, 1934, and (N) Pisgah National Forest, March 26, 1930; PENNSYLVANIA, (A) Erie, March 15, 1875; SOUTH CAROLINA, (N) Georgetown, December 28, 1890, and (A) Kershaw County, February 22, 1906; and VIRGINIA, (N) Arlington, March 22, 1885.

An additional migration record of a robin almost certainly of this race is contained in the bird-banding files of the U. S. Fish and Wildlife Service. This is of a bird banded at Germantown (Philadelphia), Pennsylvania, March 25, 1928, by Leslie Rogers and retaken on August 31, 1928, at Torquay, near Selby Cove, Trinity, southern Newfoundland.—JOHN W. ALDRICH, *Fish and Wildlife Service, U. S. Department of the Interior, Washington, D. C.*

**Glossy Ibis on Staten Island, N. Y.**—On Sunday, May 14, 1944, at 4:30 p. m. Eastern War Time, four Glossy Ibises (*Plegadis falcinellus falcinellus*) were observed for nearly an hour on the extensive lands of the Mt. Loretto institution at Pleasant Plains by Dr. and Mrs. James P. Chapin, Dr. and Mrs. A. J. C. Vaurie and the undersigned. This is the first-known occurrence of the species for Staten Island although there are records of single individuals in the New York City region in recent years. When first seen, the Staten Island birds were flying toward us from the southwest and it was noticeable that they flapped and sailed alternately, an Ibis trait, and that they flew in line as if members of a large flock. They alighted within a hundred yards of us, coming down to a small temporary pool in a field where there was a Greater Yellowlegs. The Ibises were wary, circling the spot three or four times before settling. They remained but a few minutes, then took off toward the west, flying into the sun, and soon disappeared. Later we relocated them at a larger transient pool about a half mile southwest of the first site. Here they remained for an hour or more looking for food but appeared to find none. Near them were four semi-domesticated Mallards. Other observers had been recruited by telephone and car until our group numbered ten, with several pairs of binoculars among us. When the Ibises took off again they circled the pond twice, then disappeared toward the south. The birds were not heard to utter any sounds and were not seen again.—HOWARD CLEAVES, 8 Maretzek Court, Staten Island 9, New York.

**A record of the Gannet from the Texas coast.**—The Gannet, *Moris bassana* (Linnaeus), is very rarely reported from the Texas coast. According to the mimeographed 'Bird Check List' published by The Outdoor Nature Club of Houston in 1942, the Gannet occurs accidentally in Jefferson County in winter. This is in the southeast corner of the state.

On May 1, 1944, after several days of heavy winds blowing from offshore, a Gannet flew into the Casterline fish house at Fulton. This is in Aransas County on the shore of Aransas Bay, three miles north of the town of Rockport, and approximately 225 miles southwest of Jefferson County. The bird was evidently tired from the buffeting of the winds and was caught and given to Mr. Ben A. Earp, who brought it to my

<sup>1</sup> (A) Signifies specimen in American Museum of Natural History, New York, N. Y.

(N) Signifies specimen in U. S. National Museum, Washington, D. C.



office in a sack. Mrs. Jack Hagar came to see the bird and verified the identification. The bird was adult and measured 153 cm. in wing-spread. It was taken to the beach near Rockport and liberated; on May 2, it was given fish to eat, which it did not touch, and on May 3 it was dead. Apparently it had made no attempt to fly.

According to seamen, Gannets are not uncommon in winter in offshore waters south of Galveston. Possibly they seldom venture inshore and are seldom recorded. On the other hand, Boobies might be confused with Gannets by seamen.—GORDON GUNTER, *Game Fish and Oyster Commission, Rockport, Texas.*

**Western Grebe in Michigan.**—On July 5, 1943, the writer, while fishing on Wampler's Lake, Jackson and Lenawee counties, Michigan (the county line bisects the lake), observed a Western Grebe (*Aechmophorus occidentalis*) lazily swimming in the middle of the lake. The bird was rather wary and attempts to draw nearer than a hundred and fifty or two hundred feet proved futile. It did not dive but merely kept a fixed distance from the writer's boat. The light and observing conditions were extremely good, however, and the bird's large size, coupled with the serpentine neck and definite black and white color pattern, left no doubt as to the identification. The writer had never seen a Western Grebe before but recognized it immediately from the plate in Peterson's 'Field Guide' and later examined skins in the Cleveland Museum of Natural History.

As far as the writer is able to discover there is but one other record of this bird for the state. Van Tyne records a specimen collected by F. Esbaugh on Feb. 17, 1917, at Fox Creek station, Kent Co. (see Van Tyne, Josselyn.—Check list of birds of Michigan, Occ. Pap. Mus. Zool., Univ. of Mich., No. 379, June 16, 1938).—JAMES S. FINDLEY, *Cleveland Heights, Ohio.*

**Connecticut records.**—The water birds recorded below from the shore of southwestern Connecticut appear to be rare or unusual in that state.

**CASPIAN TERN** (*Hydroprogne caspia imperator*).—Single birds of this species were seen at Fairfield Beach on September 16 and 17, 1944, by both of us and on September 19 by Arnold alone. Perhaps more than one bird was present on September 16, as individuals were found at distinctly separate spots within two hours. Although these records followed the hurricane of September 14, the species cannot be regarded solely as a storm-borne visitant to Connecticut, for a single bird was seen by Arnold at Fairfield Beach about September 25, 1943. Apparently no record of the Caspian Tern in Connecticut has previously been published.

**BLACK TERN** (*Chlidonias nigra surinamensis*).—Three or four Black Terns in full spring plumage were seen by Arnold at the mouth of the Hoosatic River about June 3, 1939. This tern is rare in southwestern Connecticut in spring and uncommon during the fall migration.

**BLACK SKIMMER** (*Rynchops nigra nigra*).—Not less than sixty-five Black Skimmers appeared at Fairfield Beach on September 16, 1944, after the hurricane mentioned above. We closely observed flocks three times in a period of two hours. Although it was impossible to determine exactly, there were some indications that more than one flock was present, such as the fact that the numbers of birds varied from fifty to sixty-five or more. The following day some twenty birds were found, and on September 18 Mr. Frank J. Novak of Fairfield saw two flocks of about twenty and fourteen, respectively. None was definitely discovered thereafter, despite daily observation.

The appearance of so many Skimmers in Connecticut seems unprecedented. Previous records of any sort are extremely rare; the last of which we know is of a single bird seen in Black Rock Harbor, Bridgeport, on October 9, 1938, by the late Mr. Chas. K. Averill, some of whose notes are now in Saunders's hands.



It seems very likely that the birds which we saw were driven north by the hurricane in its advance along the coast from the Carolinas. Mr. Averill's record was also made after a hurricane, the famous blow of September 21, 1938, but in view of the longer interval and the different track of the storm, the bird may have been an ordinary stray.—ELTING ARNOLD, Box No. 27, R. F. D. No. 3, Wilson Lane, Bethesda, Maryland, and ARKAS A. SAUNDERS, 361 Crestwood Road, Fairfield, Connecticut.

**First Ohio record of the Lark Bunting.**—On September 6, 1944, the writer picked up a Lark Bunting (*Calamospiza melanocorys*) at South Euclid, Cuyahoga County, Ohio. The bird was in immature plumage and in good flesh. When dissected, it was found to be a male bird of the year. Identification was made by Mr. W. E. Godfrey and Dr. Harry C. Oberholser, both of the Cleveland Museum of Natural History.

No previous records for this species in Ohio have been published so it appears that this is the first record for the state. The specimen is now in the Cleveland museum.—MERIT B. SKAGGS, Julian Road, South Euclid, Ohio.

***Larus ridibundus sibiricus* from the Aleutian Islands.**—On June 4, 1937, while engaged in field work on the second expedition to the Aleutian Islands by the U. S. Fish and Wildlife Service to study the fauna of that part of Alaska, we were anchored in Kiska Harbor. Douglas Gray, territorial warden and member of our party, saw three strange gulls among a number of Glaucous-winged Gulls and shot one for a specimen. This was casually identified in the field as an immature Bonaparte's Gull, and so it appeared in our field report.

A closer examination now reveals that this is a specimen of the Siberian Black-headed Gull, *Larus ridibundus sibiricus*, a female, No. 366440, Biological Surveys Collection, apparently the first record for North America. According to Hartert (Die Vögel der Palaäarktischen Fauna, 8: 1746, 1921), *L. r. sibiricus* has the upper parts darker than in *r. ridibundus*; the base of the fifth primary always gray; size larger, especially the tarsus; head blacker, not so coffee-brown as in European specimens taken at the same time of year.

The present specimen apparently is a bird in its second year, with traces of immaturity showing in the few brown streaks on the wings and the faded terminal band on the tail, but it has acquired the full dark hood and is otherwise comparable with adult specimens. Compared with an adult male from China, the Kiska specimen has a darker mantle, a decidedly darker brown hood that becomes blackish on the throat, and more black on the primaries. In measurements it falls within the range given for female *sibiricus* by Dwight [The Gulls (Laridae) of the World].

I am indebted to Dr. John W. Aldrich for calling my attention to the identity of the specimen and forwarding material for comparison.—O. J. MURIE, U. S. Fish and Wildlife Service.

**The Golden Plover in Nicaragua.**—Padre Bernardo Ponsol in a pamphlet entitled "Memoria del 'Museo de Ciencias Naturales' 1941-1943, Colegio Centro-América," 1943, p. 3, has published a record with a photograph of a Golden Plover taken on the grounds of the college at Granada, Nicaragua on April 17, 1942. The bird was found in an area that was under irrigation. Recently Padre Ponsol has sent to me a copy of the original photograph of this specimen as it is mounted for display in the museum under his charge. There is no question as to the identity and it may be supposed that the bird belongs to the eastern subspecies. For the information of those interested it has seemed desirable to repeat the record in the pages of The Auk as it is the only one known to me for Nicaragua and reports from the whole of

Central America are few. This is the original citation of the record, antedating that given in the National Geographic Magazine the following year. (See Auk, 62: 171, Jan., 1945.)—ALEXANDER WETMORE, *Smithsonian Institution, Washington, D. C.*

**Records from Churchill, Manitoba.**—On July 26, 1944, I saw three Cowbirds (*Molothrus ater*) in the town site but did not collect a specimen. I collected an immature female Bohemian Waxwing (*Bombycilla garrula*) on that date which adds to the circumstantial evidence that the species breeds in this locality. On July 28 1944, I saw three Caspian Terns (*Hydroprogne caspia imperator*) and shot two but only recovered one, due to the rough sea. Later on the same day I saw a single bird, possibly a different individual. The skins collected are now in the Royal Ontario Museum of Zoology in Toronto.—H. G. LUMSDEN, *R. C. A. F. Debert, Nova Scotia.*

**Blue Grosbeak breeding in Ohio.**—On June 9, 1940, the writer located an adult singing male Blue Grosbeak (*Guiraca c. caerulea*) near Lynx Prairie, Adams County, Ohio. On a return on June 30, 1940, this bird could not be found but another singing male was seen along Beasley Fork (two miles above its junction with Ohio Brush Creek and three miles from the Ohio River), in Monroe Township, Adams County. It is interesting to note that both of these stations are only a few miles from the only breeding area of the Chuck-will's-widow in Ohio.

On June 8 and 22, 1941, a pair of adult grosbeaks was observed repeatedly at the Beasley Fork location. The female carried food but the nest was not found until after the autumn leaf-fall. On June 6, 1942, both adults were present on the same territory and the nest with three eggs was found at a height of four feet in a tangle of mountain sumac and glaucous greenbrier. Assuming that the eggs were fresh, the writer did not return until June 21, at which time the nest was empty and two juveniles were following the female about. Later the juveniles disappeared, so, as darkness was approaching, the adult male, weighing 23.8 grams, was collected. The skin is now in the Ohio State Museum collection.

The above represents the first breeding record and the first specimen for Ohio. Kirtland, Wheaton, Jones, Dawson and Trautman did not list the Blue Grosbeak as an Ohio bird. As in most northern states, numerous 'sight records' have been reported during the migration period, although there have been few, if any, reports during the breeding season. An investigation of a large number of these reports, indicates that probably few, if any, of them are valid.—LAWRENCE E. HICKS, *Ohio State University, Columbus, Ohio.*

**Yellow-headed Blackbird breeding in Ohio.**—The Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) has always been considered as an accidental or very rare migrant in Ohio. There are only about eight acceptable records previous to 1930, including a single specimen taken (in F. Frey collection at Sandusky, Jones, 1903) and a single occurrence during the breeding season (a pair which summered south of Groveport, Franklin County in 1873 as reported by Wheaton). The old records are about equally divided between the spring and fall migrations.

Since 1930, particularly during the drouth years, reports have been more numerous (one to three nearly every year, mostly during the spring migration). My sight records are as follows: 6 at Columbus, March 8, 1931; 2 with cowbirds at O'Shaughnessy Reservoir, February 26, 1933; 22 with red-wings at Grand Reservoir, Mercer County, March 8, 1936; 2 with Rusty Blackbirds at Pymatuning Reservoir, Ashtabula County, April 5, 1937; 3 with Bronzed Grackles at Indian Lake, March 12, 1938; 21 at Bay Bridge, Erie County, March 28, 1938; 6 at Port Clinton, Ottawa

County, March 23, 1939; 1 with two Brewer's Blackbirds and red-wings near Port Clinton, April 4, 1941; 9 near Greencamp, Marion County, March 11, 1942; 12 with red-wings at Reno Beach, Lucas County, March 24, 1944.

On May 11, 1934, Emory Sawyer observed a singing male between Bay Bridge and Sandusky ('The Auk,' 51: 527, 1934). A singing male which appeared to be breeding (perhaps the same individual as above) was observed by the writer in a marsh east of Bay Bridge on May 20, 1934. A pair, presumably breeding, was observed east of the McGee Marsh, Ottawa County, May 21, 1936.

In 1938, George Metzger, owner, and Emery Tank, keeper of the Metzger Marsh, Lucas County, reported that a pair that arrived in April was seen repeatedly throughout the summer. The writer failed to find the nest after two days of searching, although later (in August) Mr. Tank saw the pair with three juveniles. In 1939, a pair was present on a territory several hundred yards to the eastward but again all attempts to find the nest were unsuccessful.

In 1940, Mr. and Mrs. F. Stearns found a male defending territory two and a half miles west of the Metzger Marsh from May 30 to June 10 (Campbell, 'Birds of Lucas County': 156, 1940). On May 18, 1940, the writer discovered a nest with four eggs in cat-tails in the Metzger Marsh near the Lake Erie shore. On a return on June 16, the young were found to have already left the nest but they could not be detected among large numbers of juvenile red-wings. On the third visit, July 21, a juvenile male, from this or another nest, was collected. The bird, weighing 92.4 grams, was in the late pin-feather stage of acquiring the deep yellow throat and breast and dark crown. The specimen is now in the Ohio State Museum collection.

Another pair was present in the same general area in 1941. None was located during the casual checks made from 1942 to 1944. Thus the Yellow-headed Blackbird has shown a definite increase since 1930 as a migrant in Ohio, and breeds in the marshes of Lucas County and probably in Ottawa and Erie counties as well.—LAWRENCE E. HICKS, *Ohio State University, Columbus, Ohio.*

**Hooded Merganser breeding in Ohio.**—Before 1930 there were very few records of the Hooded Merganser (*Lophodytes cucullatus*) summering in Ohio. Since then, at least two to a dozen individuals have been present through each breeding season, mostly at the larger reservoirs or in scattered northern Ohio counties. Most of these have been in immature plumage and by their behavior were obviously non-breeding birds.

During 1936 the writer several times observed one or both members of a pair on the marsh of the Winnous Point duck club on Sandusky Bay, Ottawa County. The nest was not found, but on June 21 several hours were spent pursuing the female with five one-third-grown young. In adjacent Lucas County, Campbell lists seven adults seen during the summers of 1930 to 1933, and nine more in near-by Erie Marsh in Michigan during 1935, 1936 and 1939, but no evidence of breeding ('Birds of Lucas County, Ohio,' Toledo Museum of Science: 51, 1940). At Buckeye Lake a few highly plumaged males have remained throughout the summer, but with no evidence of breeding (Trautman, 1940).

During the 1937 breeding season, a pair was present on my waterfowl-study tract on Pymatuning Reservoir, Ashtabula County, Ohio. The female was seen to enter the cavity of a very rotten stub which leaned far out over the water of a little inlet near Hemlock Island. Since it was impossible to reach the nest without destroying it, we waited until the family of young had left to pull down the stub and break open the nest, which then contained a single eggshell. On May 30, the hen had eight ducklings (about six days old). When last seen on June 30, only three remained.

During the 1938 season, Bert Oudette, the writer and several others observed another female using a cavity on the Pennsylvania portion of the reservoir.

During the spring of 1942, many ducks and shorebirds used a series of small ponds created by the Columbus sewage disposal plant just southwest of the city and west of the Scioto River, Franklin County. Several pairs of Wood Ducks, Mallards, Black Ducks, and Blue-winged Teals remained to breed; two broods of each species were observed. On May 14, 1942, Nelson Thompson reported a female Hooded Merganser with ten small young. Each day thereafter we attempted to find and collect a duckling to substantiate the record, but the brood appeared to be particularly elusive. Eventually the female and all but one duckling escaped to the safety of the Scioto River. After three hours of hectic pursuit from one tiny island and peninsula to the next, swimming and wading through sewage waters and debris, the writer collected the remaining duckling on May 18, 1942, thanks to the corraling assistance of Nelson Page and John Anderson. This duckling, a male weighing 56.4 grams, proved to be about nine days of age. It is now in the Ohio State Museum collection. Breeding of this species in Central Ohio, far south of its normal range and in such a unique habitat, is indeed remarkable.

During the summer of 1943, the writer discovered another female with six three-weeks-old young on a marsh in eastern Lucas County near the Ottawa County line and the Lake Erie shore. Thus the Hooded Merganser is now known to breed in four counties of Ohio: Ashtabula, Franklin, Ottawa and Lucas.—LAWRENCE E. HICKS, *Ohio State University, Columbus, Ohio.*

**Rose-throated Becard nesting in Cameron County, Texas.**—A pair of Rose-throated Becards (*Platypsaris aglaiae*) was observed working on a nest the last week in April, 1943. The locality was about thirteen miles southwest of Harlingen, Texas, in the tract used as a nesting-census area by the writer in May and June, 1938 (Bird-Lore, 40: 356, Sept.-Oct., 1938). Both the male and female were carrying material to the nest which was in a hammock or swing stage of construction. The next time the place was visited the nest was found to have been abandoned without any further additions. This beginning of a nest was of interest from the point of view of construction as the two ends of the swing were attached to separate small twigs of a black willow so that they pulled slightly apart as the larger branch above swayed in the breeze. The bottom of the nest was about twenty feet from the ground.

Later (the first week in May) another beginning of a nest was found about 200 yards south of the first. It appeared to have been abandoned at a still earlier date. It also was in a black willow and was about 22 feet above ground. About fifty feet north of this location the birds were again observed. This time they were working on an almost completed nest. The third attempt was again in a black willow and the bottom of the nest was about 21 feet from the ground. Material was still being added, however, and there was still an opening at the extreme top of the bag as well as the one at the side of the ball-like bottom. It was noted that the female made about twice as many trips to the nest per unit of time as the male and that she alone did the work on the interior. By May 7 the nest seemed to be completed. The writer was out of the region the first half of June; hence it is impossible to report on the results of the nesting. The birds could not be found when the place was visited on June 18, but the nest was in good condition and the opening was clean and firm. By the first week in July the nest was showing signs of disuse and the opening was half closed.

The male bird was somewhat 'dirty white' below. A reddish tint, which showed in the tail feathers when the tail was spread, might indicate that he was only one year old. The willow trees in which the nests were placed are about fifty feet out from a



dense bank of ash trees, vines, and underbrush (described as "edge" in the above-mentioned breeding-census report). The willows grow in open woods with grass and weeds below, but there are scattered clumps of mimosa shrubs here and there.

On June 27, 1943, a pair of Rose-throated Becards was found tending one juvenile female in a heavy ash-hackberry jungle on the Santa Ana tract south of Alamo, (Hidalgo County) Texas. The site was just outside the plot of the breeding census reported by the writer in 1940 (Bird-Lore, 42: Sept.-Oct., 1940); the whole tract is now a federal wildlife refuge. The juvenile moved only once during the half hour it was under observation and then only from one tree to the next. Both adults were quite excited and gave alarm notes which they repeated as long as the writer remained in the area.

The male in this case was not quite pure white below and it is thought that it was slightly darker on the sides of the breast than the Cameron County male. Since all the resident males that I have observed are light below, it now seems likely that the female and juvenile male which I first observed in 1937 were also residents instead of accidental visitors from the west as I at first supposed. Ridgway classified his white-breasted specimen from Nuevo Leon as *P. a. albiventris* (Birds of North and Middle America, Bull. U. S. Nat. Mus., 50, pt. 4: 851, footnote). Bent discussed the birds, reported earlier by the writer, under the heading of *albiventris*, apparently following Ridgway's lead, but suggested that they might belong to the race *richmondi* van Rossem, in case the A. O. U. should see fit to recognize that subspecies. Since this has now been done (cf. Auk, 61: 452, 1944) and it is known that our Rio Grande Delta-region birds are residents rather than accidental stragglers from the west, they should be called *richmondi*. In 1942, Mrs. D. C. Ring sent the writer a description of an "unknown" bird which she had observed on her farm north of Alamo, Texas. It was quite obviously another male Rose-throated Becard. These various records now seem to establish the species as a resident of low density in both Hidalgo and Cameron counties of Texas.

Postscript.—Since submitting the foregoing note, I have made an additional observation that is of interest. This spring (1944) a male has appeared here in Cameron County that is completely gray below except for the rose spot on the throat, including even the chin. This answers the question as to whether or not all the birds at this extreme northern limit of the range are light below. Heretofore all seen by the writer were either white below or almost so, as is mentioned in a preceding paragraph.—L. IRBY DAVIS, Harlingen, Texas.

A correction.—I wish to correct an unfortunate error which occurred on Plate 23 of The Auk for October, 1944. The upper photograph shows a Horned Lark nest, not a Lapland Longspur nest, as stated. The error occurred during selection of photographs for the paper, three years after field observations were made; it in no way affects the accuracy of the accompanying data on Lapland Longspurs.—L. I. GRINNELL, Ithaca, N. Y.



## RECENT LITERATURE

**Check-list of West Indian birds.**<sup>1</sup>—The present edition of this useful list follows the general format of the first edition, published in 1940 (but somehow escaping citation in *The Auk* at the time), with slightly smaller type but improved distinction between bibliographic references and general text.

The list, however, is completely revised, bringing the author's views on the classification of West Indian birds up to date. Many of the citations are, of course, unchanged but others are entirely rewritten. Some synonymy is added where required but some synonyms, based on West Indian birds and cited in the first edition are omitted when the subordinate status of the names has been established in recent general catalogues. Dates of arrival and departure of North American migrants are supplied for the first time and form a useful addition to the data. Since the author justifiably adheres to the International Rules of Zoological Nomenclature and not the A. O. U. Code, some differences in names will be apparent to the North American reader, and in the absence of common names from the list, a little confusion may result that can hardly be avoided under the circumstances.

The footnotes throughout the volume present the author's comments on the relationships and derivation of different West Indian birds which his long familiarity with the avifauna of the region permits him to discuss with especial authority. The check-list is one which all students of the area will find of the highest importance. —J. T. ZIMMER.

**Ducks on a prairie marsh.**<sup>2</sup>—Although the Canvasback is the focal point of the present volume, the study as a whole covers a much wider field, involving all ten species of ducks that make their summer home in the Delta Marsh at the southern end of Lake Manitoba, Canada, with lesser mention of various transient waterfowl and some other birds of the region.

All phases of the summer life of these birds in the area were studied at first hand and a mass of data accumulated which is here systematized. The spring flights, the period of courtship, the nesting season, the rearing of young, the post-breeding activities, and the autumn shooting season are taken up successively. The author's discussion of territories in these waterfowl is illuminating. He finds that the territory does not necessarily include the nesting site, although this is somewhere near, and that various females may converge from widely separated territories and nest near to each other in a relatively small area. The territory, itself, has four requirements—water, food, proximity to a nesting site, and a 'loafing spot' which, for various species, but not all of them, must be in a dry situation. The female chooses the territory but, when it is selected, the male takes the initiative in defending it. Sometimes the same territory is used for a period of years by the same species, not certainly by the same individuals. In the author's opinion, the territory is primarily defended to secure the isolation of the mated pair from sexually active birds of the same species during the copulation period.

Two distinct periods of display by the males were recognized, each with its characteristic pattern—one a courtship display and the other a nuptial one. The study

<sup>1</sup> BOND, JAMES. 'Check-list of Birds of the West Indies.' [Second edition.] 8vo, pp. XIII + 182, 1 map (fold.), 1945. The Academy of Natural Sciences of Philadelphia.

<sup>2</sup> HOCHBAUM, H. ALBERT. 'The Canvasback on a Prairie Marsh.' 8vo, pp. XII + 201, frontisp. (col.), 13 pls., figs. 1-9, 30 unnum. figs., 1944. The American Wildlife Institute, Washington, D. C. Price \$3.00 (in U. S.).

of recognition of the mate or of other individuals of the same species provided some surprising figures on the distance at which it appears to be effective.

Drakes deserted the females and territories as soon as the clutch was complete or no more than a week or ten days later. A second nesting, after the drake's departure, is doubtful. The drake's molt into eclipse plumage may begin early in the nuptial period, before it leaves the territory. The first males to molt are the earliest-mated birds, while the last are the latest-mated or the unmated birds. It is suspected that the full eclipse plumage is acquired only by young birds in their first few seasons; some individuals seven and eight years old lost their flight-feathers but not the body plumage. The Ruddy Duck was found to differ from the other resident species in that it passes the flightless period in worn nuptial plumage and, when again able to fly, molts into a dull winter plumage that is worn until late winter or early spring, when a new breeding plumage is acquired.

In the matter of sex ratios, it was found that, in general, males outnumbered the females, although a shooting-bag count during four seasons showed more females than males to have been killed except in the Mallard and Redhead. Differentials are tabulated, including the proportions of young and old birds.

These are only a few of the interesting details discussed in the book. The general purpose of the studies on which the volume is based was to uncover information that would be useful in wildlife management, to which a special chapter is devoted, but the report should interest a much wider circle of readers. It may be recommended as a valuable contribution to our knowledge of American birds.—J. T. ZIMMER.

**A Field Guide for birds of the Southwest Pacific.**<sup>1</sup>—A preface by Dr. R. C. Murphy states that this book was written because of a flood of letters asking for information on the birds of this vast but little-known area. The world war has made it a subject of general interest and curiosity to a large public instead of a few technical experts. It should be known to all readers that Dr. Mayr is the world's authority on the region and that he has been studying for years the great collections amassed by the Whitney South Sea Expedition for the American Museum of Natural History. While not, strictly speaking, a report on a long-range research project, the volume will have interest and value for technical ornithologists; it contains much unpublished information; the author's opinions on systematic problems are original and interesting. No other ornithologist today could have compiled such complete and up-to-date lists of the birds known from the various island archipelagoes, with nothing available except the technical reports on small collections scattered in many scientific journals. Our author has made an original contribution to ornithology as well as written a field guide.

However this may be, the main object of the book may be inferred from its title. It is intended primarily for the field student, not for the museum curator. It is to help him identify and name the birds he encounters, and to ascertain what kinds of birds can be expected on a given island." The various birds are described and discussed on the basis of identification marks or field characters. The book must be judged on the degree of success attained in the objects professed.

The method adopted and the arrangement of the great body of facts is admirable. Since 803 forms are treated, in ten different archipelagoes, the author had a choice between a systematic or a geographic treatment. He has devised an ingenious and happy compromise. In a General Section, as Part I, he has chapters on the seabirds,

<sup>1</sup> MAYR, ERNST. 'Birds of the Southwest Pacific. A Field Guide to the Birds of the Area between Samoa, New Caledonia, and Micronesia.' 8vo, pp. xix-316, pls. I-III (in color), figs. 1-16, map on inside front cover, 1945. Macmillan Co., New York. Price \$3.50.

shorebirds, the land and freshwater birds. The last is particularly important, as it attempts to introduce for the first time to the ignorant reader many unfamiliar Oriental and Australian families of birds. Characteristic or widely ranging genera and species are given by way of illustration; three excellent colored plates by Jaques and 16 text figures by Alex. Seidel depict a total of 55. The only criticism I have here is that there might have been more liberal references to the plates in the text. Americans, for instance, are mostly unfamiliar with the Old World flycatchers; it appears that *Rhipidura* and *Monarcha* are two characteristic genera, both of which are illustrated in color. The reader of page 92 would refer immediately to Plate 3, figs. 26-28, had there been a cross reference, to see what these birds look like. The fact that in certain cases the species figured is different from the one mentioned in the text makes no difference in gaining a mental picture of the genus.

Part II is geographic. For reasons of faunal affinity the ten archipelagoes are combined into seven; hence seven chapters give the land and freshwater birds of each area. The descriptions of each species are confined to those characters diagnostic in the field. If any species has already been described in Part I, a cross reference renders repetition unnecessary. The first two chapters on the widely ranging sea and shore birds must be consulted for records for the various islands; this avoids redescribing the Golden Plover seven times, and saves much space. Each chapter opens with a geographic and faunal analysis. There is a special summary geographical review for the Solomon Islands, and a special section on Rennell Island, which should have been listed in the table of contents. In all cases where several to many species of one family or order occur in one area, there are helpful color keys.

The final test of any field guide is whether it is found useful and workable by field students. The reviewer is also bound to remember that a field guide is not an encyclopedia, and he should be chary of complaining of omissions or too great brevity. This particular reviewer is in a happy but paradoxical situation in that he knows something to considerable about the sea and shore birds, little to nothing about the land birds. It seems to me that a remarkable family like that of the Kagu might rate a text figure or at least a few lines of description about some of its many characters besides color. I certainly want to know what the shape and size of the bill are in an uncertain family like that of *Lampromia*. My field experience with the rails of three continents convinces me that the size and shape of the bill are a most important aid to identification in the field; I can hardly believe that they are of no consequence in the seven rails of Micronesia. The only fault I have to find with Dr. Mayr's method is his too great reliance on artificial or color characters, and his apparent idea either that generic and structural characters are not usable, and helpful in observing living birds, or that the amateur field student is "scared off" by a book that does use them. In a "popular" guide it is not necessary to suppress these details.

This suspicion reaches conviction when examining the keys to the terns and shore birds. While miracles of ingenuity, they are unnecessarily artificial. In the Shorebirds, closely related genera and species are widely separated, and two birds in different families are bracketed together and separated by color characters, of trivial importance and no more striking than the family characters. The tyro can recognize a Stilt, a Plover, a Curlew, a Godwit, a Sandpiper, or a Snipe as such long before he can hope to discriminate most of the species, and the key should have been constructed on this basis. The key to various species of *Sterna* is even more unfortunate, as the important colors of the bill, which vary seasonably and between adults and immature, are not correctly stated in certain cases.

There are two final features of the book which are all too rare and beyond praise.

The author is more than willing to make it clear that he does not possess final or complete knowledge. Some of his opinions or statements are tentative; they may be correct. Some of the field characters may not work; he hopes that readers will point out others that he didn't know about. Throughout the book there are useful hints to observers; opportunities for them to add to knowledge are constantly offered; possible or probable range extensions are indicated; we are told if the life history or nesting habits are unknown. Is a certain bird extinct or not? These hints will be just as valuable to the ornithologist as to the amateur observer.

Dr. Mayr's book is perhaps the most difficult undertaking ever attempted in this field of ornithological activity. Most regional field guides have not been written until the birds were far better known systematically and geographically, with far more experience and knowledge of them in life. Let the reader remember that most of my unfavorable comments are controversial, in that they are matters of opinion. The author's struggle with his many difficulties must be described as a brilliant success. My admiration and congratulations are gladly proffered. Let us hope that Dr. Mayr's efforts will be rewarded not only by the esteem of his colleagues and the thanks of those able to use the book in the field, but also by the successful sale it so richly deserves.—LUDLOW GRISCOM.

**The birds of Ceylon.**<sup>1</sup>—A generation ago Ceylon was considered one of the best known parts of the Indian Empire. Collectors, therefore, concentrated on other regions until it was recently found that the knowledge of the birds of Ceylon was falling far behind that of these other sections. To fill this gap the British and the Colombo museums jointly conducted an Avifaunal Survey of the island. It was particularly fortunate that Hugh Whistler, who knew Indian birds better than any of his contemporaries, was able to complete the report on this collection, shortly before his untimely death. By including also the birds not obtained by the Survey, Whistler has prepared a complete list of the known birds of Ceylon. Of the 384 listed forms, only 239 nest on the island; 22 species and 77 subspecies are endemic. Six species have two endemic subspecies on Ceylon. All but one of the remaining 162 forms are identical with the South Indian races.

The Ceylon races differ from those of South India for the most part either in their smaller size or in their darker plumage. In three races, *Kittacincla m. leggei*, *Turdus s. kinnisi*, and *Hemipus p. leggei*, the females have practically attained male plumage. Some Ceylon races are remarkable in the suppression of the seasonal plumages, found normally in the species—for example, in certain warblers (*Franklinia*, *Prinia*), the Kentish Plover, and the Stilt (*Himantopus*). A number of the endemic species seem to be the result of double invasions. Most of the new races discovered by the Survey had been described previously by Whistler. Only five are included in this report: *Cinnyris lotenia hindustanicus* (India) (p. 199), *Piprisoma agile zeylonicum* (p. 201), *Brachypternus benghalensis jaffnensis* (p. 206), *Merops orientalis ceylonicus* (p. 223), and *Himantopus himantopus ceylonensis* (p. 277).

There are many valuable discussions on the taxonomic status of the Ceylon populations of various species, but the impression is given that lack of adequate material has, in many cases, prevented the reaching of final conclusions. Stuart Baker's archaic and frequently completely absurd generic nomenclature is unfortunately followed throughout. Owing to the long delay between completion and publication, the recent work of Deignan, Delacour, Amadon, and other workers has not been incorporated. These are only minor blemishes in a most useful report, a lasting

<sup>1</sup> WHISTLER, HUGH. 'The Avifaunal Survey of Ceylon conducted jointly by the British and Colombo Museums.' *Spolia Zeylanica*, 23: 119-321. 8 pls. August 23, 1944. Price Rs. 6.



monument to the memory of Hugh Whistler, as fine a gentleman and sound an ornithologist as I have ever had the fortune to meet.—E. MAYR.

**West Sumatran birds.**<sup>1</sup>—This paper, based mainly on Dr. W. L. Abbott's splendid collections in the United States National Museum, has interesting chapters on the geography and the ornithological history of the islands in question and ends with a summary and conclusions. It is clear and concise and interesting from the point of view of distribution and speciation. An excellent map accompanies the text.

The West Sumatran Islands form a chain 600 miles in length fringing the Indian Ocean coast of Sumatra. Comparatively low, no island reaching an altitude of 2000 feet, they are for the most part covered with forest and scrub. Except for Nias, none is heavily populated. The larger islands lie on an average about 60 miles off the coast.

The bird population, as might be expected, has been received mostly from Sumatra (84 per cent) via the Banyak and Butu islands which lie closest inshore, and from there funnelled out north and south to the other islands.

The avifauna comprises 280 species and subspecies (including migrants). For many years these islands have been a paradise for the 'splitter' and some 220 species and subspecies have been described from them. The fact that Ripley in his careful analysis can recognize no less than 114 (111 endemic) of them attests to the high proportion of endemism found in the region. Differentiation takes the form of larger size in 58 per cent of the cases. A barbet (*Cyanops australis*) is said to be found only on Nias, but a distinct form is known from the Batu Islands which raises the number of endemic forms to 112.

Ripley has very successfully cleared the confusion into which the status of the avifauna had fallen. Although papers on the various islands have appeared since 1863, this is the first to be written on the entire chain as a whole.—R. M. DE SCHAUENBERG.

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- ZIMMER, JOHN T., AND PHELPS, WILLIAM H. New species and subspecies of birds from Venezuela. 2. *Amer. Mus. Novitates*, 1274: 1-9, fig. 1, 1 map, Jan. 25, 1945.—*Crypturellus plarilepus* and *Myioborus cardonai*, new species; *Synallaxis cabanisi griseipectus*, *Grallaria griseonucha tachirae*, *Platyrinchus mystaceus imatacae*, *Troglodytes rufulus fulvicularis*, *Tachyphonus cristatus orinocensis*, and *Mitrospingus oleagineus obscuripectus*, new subspecies.

## CORRESPONDENCE

## ON 'HYLOCICHLA GUTTATA OROMELA'

EDITOR OF 'THE AUK':—The Nineteenth Supplement to the A. O. U. Check-List (Auk, 61: 441-464, 1944) does not accord recognition to the small race of Hermit Thrushes described by Dr. Oberholser under the name *Hylocichla guttata oromela* (Proc. Biol. Soc. Wash., 50: 117-120, 1932). I have not had opportunity to examine skins of representatives of this proposed race, except at the Colorado Museum of Natural History, and cannot present arguments on its validity on ordinary taxonomic grounds. However, I have been able to study Hermit Thrushes in Rocky Mountain National Park, within the range of this proposed race, and a few general comments resulting from extensive field observations may be of interest.

Audubon's Hermit Thrushes breed abundantly in the park in the Transition and Canadian zones, between 7,800 feet (and lower outside the park) to 10,000 feet. Their song is predominant everywhere throughout the lodgepole pines of the latter zone on both sides of the continental divide. I do not remember ever hearing the typical song of *auduboni* above 10,000 feet. The Hudsonian Zone begins abruptly on the slopes at 10,000 feet and is comprised of glades between Engelmann spruces and firs that form a distinctive belt to timberline at 11,000 feet. Here also are to be found a number of Hermit Thrushes, but these are conspicuously smaller than those breeding lower down, and their song is strikingly different; these birds are so distinctive that a glance can differentiate them, as does their song. Mr. R. J. Niedrach has discussed this variation in the Hermit Thrushes of the high Rockies with me, and in his 'Birds of Denver and Mountain Parks' (Niedrach, R. J. and Rockwell, Robert B., Colorado Mus. Nat. Hist. Popular Series 5: 125, 1939) expressed his belief that *oromela* would prove a valid race.

Naturally, a field ornithologist cannot presume to try to settle a basically taxonomic problem; but if this proposed race has such strikingly noticeable field characters and apparently occupies a specialized ecological nesting habitat, there is some ground for believing it may be a valid race. The committee on nomenclature may be interested in reconsidering this form to determine whether these indications resulting from field observations are verified by study of series of skins.—FRED MALLERY PACKARD, Lt. (j. g.) USNR.

## THE NOMENCLATURE OF WILLIAM BARTRAM

EDITOR OF 'THE AUK':—Few readers of The Auk may see the article on "Legitimacy of Names in Bartram's 'Travels'" by Dr. Henry W. Rickett of the New York Botanical Garden, published in Rhodora, Journal of the New England Botanical Club [46 (No. 551): 389-391, Nov., 1944].

Hence it may be well to quote briefly from it. The author, who is a specialist on taxonomy and bibliography, says: "Bartram's *Travels* does not meet current requirements for the publication of specific epithets. Art. 68 of the *International Rules* says that 'specific epithets are illegitimate . . . and must be rejected . . . when they were published in works in which the Linnean system of binary nomenclature for species was not consistently employed.'" and, after presenting data on plant names, adds: "It is obvious that Bartram did not consistently employ the binary system. The same conclusion results from looking through the list of birds."—W. L. MCATEE, Fish and Wildlife Service, Chicago, Ill.

## OBITUARIES

HUGH BIRCKHEAD, an Associate of the Union since 1936, was killed in action in France on November 13, 1944. He had been in the army for twenty-six months as a member of a tank-destroying battalion and had fought in the Tunisian and Sicilian campaigns as well as in the invasion of Normandy and the subsequent fighting in France.

He was born in Baltimore on January 18, 1913, a descendant on both father's and mother's sides of families distinguished in colonial history. Julia Ward Howe, author of the Battle Hymn of the Republic, was his great grandmother, Samuel Ward, first chairman of the Continental Congress, Roger Williams, founder and first governor of Rhode Island, and the sister of General Francis Marion were other ancestors. After graduation from St. Paul's School, Concord, N. H., he came to the American Museum of Natural History, New York City, as a volunteer, helping with the unpacking and arranging of the Rothschild Collection. On the basis of the excellent record he established in this work, he was given employment as assistant in the department though he previously had had no specialized training. From 1937 to February, 1942, he assisted in rearranging nearly the entire Old World Collection of the department, leaving it in the most meticulous order when he left for the army. He was a perfectionist in everything he did, never leaving a job superficially or only half done. Among his published papers are a report on the Birds of the Sage West China Expedition and, in joint authorship with Dillon Ripley, a revision of the Polynesian genus *Ptilinopus*. He was a gifted draftsman and ever ready to supply his friends with an original drawing for a Christmas card or a book plate. In addition to drawing birds, he was very talented in architectural drawing and had a great knowledge of the Gothic style. In 1938 he attended the 14th International Ornithological Congress at Rouen. At this time he studied not only European birds but also Gothic cathedrals in France and England.

His enthusiasm for birds was without limits. No weather was too bad or distance too great when he set out to search for some rare bird or its nest. All of his experiences, usually in company with his uncle, Captain H. N. Hall, were meticulously recorded in a diary. He kept up this habit even during the difficult period of war and extracts of his notes have been published in the Audubon Magazine.

A promising career was cut short by his death, but the devotion to ornithology which he inspired will continue to live.—E. MAYR.

RONALD WARD SMITH, an Associate of the American Ornithologists' Union since 1932, was reported killed in his 32nd year, on September 11, 1944, in active service, flying overseas with the Royal Canadian Air Force. He was born at Halifax, Nova Scotia, Canada, May 21, 1913, the son of Mr. and Mrs. J. William Smith.

R. W. Smith early displayed an interest in birds, and came under the influence of the enthusiastic Nova Scotia sportsman and ornithologist, R. W. Tufts. Smith's interest soon widened to mammals, modelling and painting of birds, and collecting birds and mammals. Before he completed his studies at Acadia University in 1934, for a Bachelor of Science degree, he had made an extensive collection of Nova Scotia birds for the Cleveland Museum of Natural History. During his final year at the university he also collected locally for Allan Brooks, L. B. Bishop, and the Museum of Vertebrate Zoology at Berkeley, California.

In the fall of 1934 he came to the National Museum of Canada as a volunteer assistant, to study museum methods, and here he quickly displayed his aptitude for

the work. In 1935 he secured a temporary appointment in the Bureau of Geology and Topography and was detailed on various kinds of work in the National Museum until spring of 1936. From June to October 1936 he collected birds and mammals for the National Museum in northern Manitoba, along the Hudson Bay Railway. During the first part of this period, Mr. P. A. Taverner was in the field in charge of the party, later leaving Smith in charge.

In 1937, from January to September, he collected for the Academy of Natural Sciences, Philadelphia, on the George Vanderbilt South Pacific Expedition, visiting Panama and many island groups in the south Pacific.

After a period spent in studying Nova Scotia birds and mammals, in the fall of 1938 Smith entered the University of California at Berkeley, where he secured his Master's degree in Zoology in 1939. His thesis, 'The Land Mammals of Nova Scotia,' published in the *American Midland Naturalist* (24: 213-241, July, 1940), was based largely on the private collections he had brought together and his studies at various times since he was in high school. During his time at Berkeley, he helped prepare a number of exhibits showing California life zones for the San Francisco World's Fair of 1939, and also collected vertebrates in southern California, Nevada, Oregon, Montana, Wyoming and Idaho for the Museum of Vertebrate Zoology.

Leaving Berkeley in September, he was employed, under a two-year Carnegie Foundation Grant to Queen's University at Kingston, in renovating and developing the Biological Museum at Queen's for educational and research purposes. In November, 1941, he volunteered for service in the Royal Canadian Air Force, and went overseas the next year as Sergeant. He received his commission as Pilot Officer in May 1943. Even when in the Air Force he found time to carry on his main interest, and his letters from the British Isles spoke of occasional opportunities to study birds, meet ornithologists, and make collections of small mammals in the north of Scotland.

Smith's most important publication was 'The Land Mammals of Nova Scotia,' a critical study. He also published two short papers describing two new races of Nova Scotia mammals, a short note on Galapagos shearwaters and man-of-war birds in the 1939 'Condor,' and some noteworthy records for Nova Scotia in the 1938 'Auk.'

To those of us who knew him, his cheery manner and good nature were captivating. He had a wonderful faculty of making friends wherever he went. With a versatility of talents and an intention to use them in his native country, his loss is a great one to us. He is survived by two sisters: Mrs. C. M. Campbell, Ottawa, and Mrs. W. B. Perry of St. John, N. B., and a brother, Murray Smith, of Esquimalt, B. C.—A. L. RAND.

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#### NOTES AND NEWS

READERS of 'The Auk' will be interested to learn that Mr. W. P. C. Tenyson has taken over the compilation and editing of the Aves section of the 'Zoological Record' in the place of the late W. L. Sclater. Authors who wish to be sure that their papers are not overlooked in this invaluable bibliography should send their reprints to Mr. Tenyson, care of the British Museum (Natural History), Cromwell Road, London, S. W. 7, England.

NOTICE.—In case a bill for dues was received after your check or money order was sent in, it may be disregarded. Receipt of this number of 'The Auk' is evidence that your record is clear for the current year.—FREDERICK C. LINCOLN, *Treasurer*.



THE SIXTY-SECOND STATED MEETING OF THE  
AMERICAN ORNITHOLOGISTS' UNION

BY LAWRENCE E. HICKS

THE seventeenth meeting to be held in New York City took place October 25, 1944. Headquarters were at the American Museum of Natural History and all the business sessions were held there.

Due to the request of the Office of Defense Transportation, a regular meeting, involving presentation of papers, annual dinner, social gatherings and field trips, was not held. However, the by-laws of the A. O. U., and the regulations governing incorporated societies are such that it was found necessary to hold a 'streamlined,' one-day business session. This was similar to the Monday sessions of past meetings and, of course, was open only to members of the Council, Fellows and Members. The program sessions, open to Associates and the general public, usually arranged for Tuesday, Wednesday, and Thursday, were eliminated.

## BUSINESS SESSIONS

The meeting on Wednesday, October 25, included two sessions of the Council, a meeting of the Fellows at 3:45 P. M., and a meeting of the Fellows and Members at 4:00 P. M. Twelve members of the Council, 17 Fellows and 27 Fellows and Members, were present at these three meetings. Ten members of the Council met again Thursday morning to complete business on the agenda.

Due to the lack of vacancies, there were no elections to the class of Fellows. Seven Members and 142 Associates were elected. On Sept. 30, 1944, the paid A. O. U. membership (as checked against the Treasurer's report) was as follows: Patrons, 3; Emeritus Fellows, 2; Honorary Fellows, 14; Fellows, 50; Members, 126; Associates (including 107 paid Associate-elects), 1463. Total (including 76 Corresponding Fellows who do not pay dues), 1734. This is a net increase of 85 members over the same date in 1943. In addition there were 208 subscribers, a net increase of 14.

There had been 12 resignations (of Associates) and 24 deaths of members during the year: 4 Honorary Fellows, 4 Members and 16 Fellows. As in 1943, 3 members met death while in military service. On Jan. 1, 1945, the known vacancies were as follows: Honorary Fellows, 6; Corresponding Fellows, none; Fellows, none; Members, 17; Associates, unlimited.

The Treasurer's report, prepared by Acting Treasurer Potter,

reviewed how various problems were met due to the long illness and subsequent death of Treasurer J. Fletcher Street. The report showed about \$543.00 more income from membership dues and subscriptions than during the previous year (1943), but less from contributions and endowment income. The total income was slightly more than during the previous year. Even though five issues of 'The Auk' were paid for during 1944, expenses were about \$182.00 less, mostly due to expenses contributed in the offices of Treasurer and Secretary. The total cash and inventory on hand amounted to \$2,178.05—about \$1,240.00 more than at the end of the preceding year.

The Treasurer's report was accepted, with a special vote of thanks to Mr. and Mrs. Julian K. Potter for their outstanding services to the Union during the emergency created by the illness and death of Treasurer Street.

The Secretary reported that the accumulated surplus in the endowment Educational Fund had made it possible to grant 21 A. O. U. scholarship memberships to worthy students in 1943, 24 in 1944. The small surplus remaining, plus the new income, will make it possible to grant only about 14 in 1945. It would seem very desirable to solicit special gifts or endowment additions so that the A. O. U. could build its membership 'at the bottom' by granting no less than 40 to 50 free memberships each year to promising bird students able to qualify.

In regard to post-war planning, the Secretary pointed out that the Union will each year find it necessary to do more with an income of less purchasing power. The point was made that it is urgent to adopt a long-time plan for membership increase that would, in ten years or less, enlarge the Union from 1,700 members to 2,500 or 3,000. To do this it will be necessary to devise a plan for sharing the work burden and attain desired membership quotas in each state and province, as well as build a nucleus of A. O. U. members in many large areas not now represented. Since it now costs about 30 cents to print extra copies of 'The Auk' (\$1.20 per volume) and about 30 cents per year to service each member, each new associate paying dues of \$3.00 represents an annual profit of \$1.50 per member. The present membership size is little more than adequate to absorb the necessary 'overhead.' A sizable membership increase would enable the Union to greatly increase its services and publications.

The Council voted to publish each year in 'The Auk' the names of those responsible for new members, with the numbers obtained by each. The President was authorized to appoint a committee to prepare a design for a new A. O. U. membership certificate. The President was also instructed to appoint a Membership Committee of sufficient

size and geographic representation to canvass the field adequately each year for candidates to Associate membership. The Secretary's report was accepted with thanks for the various concrete suggestions made.

Mr. James Savage read the report of the Investing Trustees. This showed that the A. O. U. endowment funds, as of Sept. 30, 1944, totalled \$38,567.19, an increase of \$2,821.76 during the past year due to appreciation, and an increase of \$356.25 due to new funds received from the Treasurer. The income for the year ending Sept. 30, 1944, was \$1,694.48, representing average earnings of about 5%—a fine record. This report was accepted with especial thanks for the fine services rendered.

The report of the Canadian Membership Committee, given by Hoyes Lloyd, indicated that dues had been received from 6 Fellows, 9 Members, 58 Associates, and 1 Subscriber—a total of 74—with receipts (including a \$449.98 bank balance carried over from 1943) of \$716.22. Bank charges, minor expenses and the purchase of a Canadian 5th Victory Loan Bond (cost \$500.06) as authorized, had reduced the amount in the bank to \$205.38. This report was accepted with thanks.

The retiring members of the Council (Frederick C. Lincoln, Rudyerd Boulton and George M. Sutton) were replaced for three-year terms by J. Van Tyne, Ernst Mayr and Austin L. Rand. The 1945 officers elected were as follows: *President*, James L. Peters; *Vice-Presidents*, George Willett and Hoyes Lloyd; *Secretary*, Lawrence E. Hicks; *Treasurer* and *Business Manager*, Frederick C. Lincoln. The Union voted to decide the time and place of the next meeting by mail ballot of the Council.

Two new amendments to the By-laws, which had been passed in 1943 and laid on the table for final action in 1944, were given final and favorable action. These change Sections 4 and 5 of Article I to reduce the size of the class of Honorary Fellows from 25 to 20, and the class of Corresponding Fellows from 100 to 75 (with not more than four of the latter to be elected at any single meeting).

The Council recommended to the Editor that 'The Auk' be limited to 600 pages in 1945, plus not to exceed 24 additional pages of extra literature citations, plus such additional pages as special contributions make possible, and that no color plates be printed in 1945 unless the cost is entirely contributed. The edition of 'The Auk' was also limited to 300 copies in excess of current needs.

The 1944 award of the Brewster Medal was made to Roger Tory Peterson in recognition of his Second Edition of 'A Field Guide to the Birds.'

By special resolution, the Union expressed its appreciation of the kind hospitality of the American Museum of Natural History and of the arrangements made by the Chairman of the Local Committee (Dr. Robert C. Murphy), and to the anonymous donor of the delightful dinner arranged for 27 delegates at the University Club.

#### ATTENDANCE

The 1944 meeting, the 17th to be held in the New York City area, had an attendance of 27: 16 Fellows, 1 Honorary Fellow, and 10 Members. Members were present from 10 states and provinces: New York, 11; Washington, D. C., 4; Massachusetts, 2; New Jersey, 2; Ohio, 2; Michigan, 2; and one each from Pennsylvania, Ontario, Maine and Connecticut.

CONNECTICUT, 1—*Member*, Aretas A. Saunders, Fairfield.

MAINE, 1—*Fellow*, Alfred O. Gross

MASSACHUSETTS, 2—*Fellows*, Ludlow Griscom, James L. Peters, Cambridge.\*

MICHIGAN, 1—*Fellow*, J. Van Tyne, Ann Arbor. 1—*Member*, Joseph J. Hickey.

NEW JERSEY, 2—*Members*, B. S. Bowdish, Demarest; C. H. Rogers, Princeton.

NEW YORK, 5—*Fellows*, C. William Beebe, James P. Chapin, Ernst Mayr, Robert C. Murphy, John T. Zimmer, New York City. 1—*Honorary Fellow*, Jean Delacour, New York City. 5—*Members*, Lee S. Crandall, F. L. Jaques, Mrs. W. W. Naumburg, John T. Nichols, New York City. James Savage, Buffalo.

OHIO, 2—*Fellows*, Lawrence E. Hicks, Columbus; Harry C. Oberholser, Cleveland.

ONTARIO, 1—*Fellow*, Hoyes Lloyd, Ottawa.

PENNSYLVANIA, 1—*Fellow*, Rodolphe M. de Schauensee, Devon.

WASHINGTON, D. C., 3—*Fellows*, Herbert Friedmann, Ira N. Gabrielson, Alexander Wetmore. 1—*Member*, John W. Aldrich.

#### ELECTION OF OFFICERS

The election of officers for 1945 resulted as follows: *President*, James L. Peters; *Vice-Presidents*, George Willett and Hoyes Lloyd; *Secretary*, Lawrence E. Hicks; *Treasurer*, Frederick C. Lincoln; *Members of the Council*, (in addition to officers and ex-presidents) for three years, J. Van Tyne, Ernst Mayr and Austin L. Rand.

The Council re-elected John T. Zimmer Editor of 'The Auk'; Frederick C. Lincoln, Business Manager; Julian K. Potter, James Savage and Rodolphe M. de Schauensee, Trustees; and the President, the Secretary, the Treasurer, Rodolphe M. de Schauensee, Ludlow Griscom and Robert T. Moore, Members of the Finance Committee.

#### ELECTION OF FELLOWS, MEMBERS AND ASSOCIATES

FELLOWS, none (no vacancies).

MEMBERS, 7—Robert P. Allen, New York City; Richard M. Bond, Portland Oregon; Maurice Brooks, Morgantown, West Virginia; Amelia R. Laskey, Nashville, Tennessee; Eugene P. Odum, Athens, Georgia; William H. Phelps, Caracas, Venezuela; Charles F. Walker, Put-in-Bay, Ohio.

ASSOCIATES, 133—(See following list).



## ASSOCIATE MEMBERS OF THE A. O. U.

## ELECTED 1943-1944

ALI, SALIM A., 33 Pali Hill, Bandra, Bombay Suburban District, India.....	1944
AYRES, CHARLES C., JR., 922 N. Green St., Ottumwa, Iowa.....	1944
BAILY, ALBERT L., III, R. F. D. 1, West Chester, Pa.....	1943
BAILEY, MRS. LAURA B., 820 Alhambra Circle, Coral Gables, Florida.....	1943
BAKER, PAUL S., Pearsall Way, Bridgeport, Conn.....	1944
BARNÉS, VENTURA, JR., Box 3117, Mariana Station, Mayaguez, Puerto Rico..	1944
BATTENBURG, JOHN D., 7627 Forest View Drive, St. Louis, Mo. ....	1944
BAYNARD, OSCAR E., P. O. Box 124, Plant City, Florida.....	1944
BEADLE, SPOFFORD, 2413 W. 17th St., Wilmington, Del.....	1943
BEAL, JOHN LAURENCE, Gastonia, N. C.....	1944
BEAMER, MRS. MARY, 322 S. Leonard, Liberty, Mo.....	1943
BIAGGI, VIRGILIO, JR., University of Puerto Rico, Mayaguez, Puerto Rico....	1944
BIERMAN, DONALD, 2537 N. Richard St., Milwaukee 12, Wis.....	1944
BIETTE, ROBERT NORMAN, Pennellville Rd., R. D. 1, Brunswick, Maine.....	1944
BLOOR, EDWIN D., JR., Lawrenceville, N. J.....	1944
BOHN, HERMAN L., 33-29 171 St., Flushing, N. Y.....	1944
BOOTH, ERNEST S., Dept. of Biology, Walla Walla College, College Place, Wash.	1944
VON BOROWSKY, MISS LISA, Chinsegut Sanctuary, Brooksville, Florida.....	1943
BOWLES, CHESTER, JR., 152 E. 62nd St., New York, N. Y.....	1944
BREIDING, GEORGE H., 108 W. Woodruff, Columbus 1, Ohio.....	1943
BRESLAU, LEO, 480 Canal St., New York, N. Y.....	1944
BROOMAN, EDWIN WILLIAM, 590 River St., East Prince Albert, Saskatchewan, Canada.....	1943
BROWN, ELVERE, 779 Wagner St., Columbus 6, Ohio.....	1944
BUCHANAN, FORREST, Amsterdam, Ohio.....	1944
BURES, JOSEPH A., 802 N. Madeira St., Baltimore, Md.....	1944
BURNETT, MISS FRANCES, Proctor St., Manchester, Mass.....	1944
CAMPBELL, J. D., 319 Ford St., Geneva, Ill.....	1944
CARNES, MRS. HERBERT E., 25 Kenwood Rd., Tenafly, New Jersey.....	1944
CAULWELL, WILLIAM H., 707 Park Ave., Lakewood, New Jersey.....	1944
CHAPPEL, LAWRENCE A., 861 Ocean Ave., New London, Conn.....	1943
CLAPP, MISS VIRGINIA L., 97 Crest Road, Wellesley, Mass.....	1943
COGSWELL, HOWARD L., 3807 Sierra Grande St., Pasadena 8, Calif.....	1943
COLE, CHARLES FRANKLIN, 941 Corporation St., Beaver, Pa.....	1944
COLTON, HAROLD S., Museum of Northern Arizona, Fort Valley Rd., Flagstaff, Ariz.....	1944
CONN, ROBERT C., 769 Park Ave., Bound Brook, New Jersey.....	1944
COWAN, MISS ELLEN J., c/o Miss M. Loynachan, Apt. 18, 6720 Sherbrooke St., W. Montreal, Quebec, Canada.....	1944
CROCKFORD, MRS. H. D., Box 816, Chapel Hill, N. C.....	1943
CURRY, DR. HASKELL B., 6709 N. Sixth St., Philadelphia, Pa.....	1943
CYR, ELSIE S. (MRS. HOWARD), Residence Parke Circle, Palmerton, Pa.....	1943
DALKE, DR. PAUL D., Missouri Cooperative Wildlife Research Unit, University of Missouri, Columbia, Mo.....	1944
DAVIS, PROF. HARRY T., Director of N. C. State Museum, Raleigh, N. C.....	1943
DECKER, C. O., Illinois Audubon Soc., Lincoln Park, Chicago, Ill.....	1943
DELISLE, DONALD GORDON, Naval Activity No. 2 (M), Navy 138, Fleet P. O., New York, N. Y.....	1944



DENKER, CHARLES REED, c/o DuPont, S. A.—Aptdo. 1799, Mexico, D. F., Mexico.....	1944
DICE, DR. LEE RAYMOND, Laboratory of Vertebrate Biology, University of Michigan, Ann Arbor, Mich.....	1944
DOBBINS, MISS EDITH, 1456 W. Clifton Blvd., Lakewood, Ohio.....	1943
DOERING, HUBERT R., 2 Midland Gardens, Bronxville, N. Y.....	1944
DOWNING, GLENN R., 225 Richards St., Iowa City, Iowa.....	1944
DOWNING PAUL E., 835 Waukegan Ave., Highland Park, Ill.....	1943
DOYLE, WILLIAM L., Biological Laboratory, Bryn Mawr College, Bryn Mawr, Pa.....	1943
DRAKE, DONALD M., 102 Buena Vista, Modesto, Calif.....	1944
DRUMMOND, KATHERINE R. (MRS. J. B.), 19 Ship Channel Rd., So. Portland, Maine.....	1944
DUFF, C. V., 1922 Tamarind Ave., Hollywood 28, Calif.....	1944
ELKINS, MRS. HERVEY B., 107 Third Ave., Glen Burnie, Md.....	1944
ERIKSSON, HAROLD, 107 E. Cottage Ave., Haddonfield, N. J.....	1944
ETZ, ELIZABETH, 98 Edgewood St., Wheeling, W. Va.....	1943
EVERETT, CARL H., Dean, Sunflower Junior College, Moorehead, Miss.....	1943
EVERETT, MISS LOUISE, 3824 Pittsburg Ave., South Minneapolis, Minn.....	1944
FALLS, BRUCE, Arlington Ave., Toronto, Ontario, Canada.....	1944
FINDLEY, WILLIAM HUXLEY, College St., Poland, Ohio.....	1944
FISHER, HARVEY IRVIN, Museum of Vertebrate Zoology, University of California, Berkeley, Calif.....	1944
FRIED, RUDOLPH S., Katonah, N. Y.....	1943
FULLER, RAYMOND T., Winterton, Sullivan Co., N. Y.....	1943
FUNSTEN, R. FAIRFAX, 19 Wydown Terrace, St. Louis, Mo.....	1944
FRY, J. D., 3610 Durocher St., Apt. 15, Montreal, Quebec, Canada.....	1944
FRY, DARLAN, 45 E. 49th St., New York 17, N. Y.....	1944
GARDENIER, DR. HAROLD C., 381 Broadway, Westwood, N. J.....	1943
GARDNER, MRS. I. C., 12 Shepherd St., Chevy Chase, Md.....	1943
GARLAND, KESHON, Columbus Road, Demarest, N. J.....	1943
GERLACH, JOHN ROCK, 13309 Merl Ave., Lakewood 7, Ohio.....	1944
GORMLEY, A. L., Arnprior, Ontario, Canada.....	1944
GRACE, LUCILE C. (MRS. C. J.), Hilton's Crossing, Slingerlands, N. Y.....	1944
GRANT, WILLIAM JAMES, 1300 York Ave., New York, N. Y.....	1944
GREENHALGH, CLIFTON M., Kanab, Kane Co., Utah.....	1944
GRIFFEE, W. E., 510 Yeon Bldg., Portland 4, Ore.....	1944
GROSSMAN, LEONARD J., 580 W. End Ave., New York, N. Y.....	1944
GROVES, MALCOLM FREEMAN, Milton Academy, Milton, Mass.....	1944
GRUBE, GEORGE, Muhlenberg College, Allentown, Pa.....	1943
HARGRAVE, LYNDON LANE, Box 183, Benson, Ariz.....	1943
HARRISON, HAL H., Tarentum, Pa.....	1944
HARSHMAN, MRS. DORIS E., 83 Indian Rd., Toronto 3, Ontario, Canada.....	1944
HEINLE, CHARLES A. S., 334 Magee St., Philadelphia 11, Pa.....	1944
HERBERT, RICHARD A (UGUSTIN), 961 Fox St., New York, N. Y.....	1943
HERMAN, DR. CARLTON M., Division of Fish and Game, Ferry Bldg., San Francisco, Calif.....	1943
HILL, EUGENE, 4445 48th St., San Diego 3, Calif.....	1944
HOLLISTER, HAL LOVE, 11 East 75th St., New York 21, N. Y.....	1944
HORNE, MRS. WILLIAM D., JR., Barrington, Ill.....	1943

HOWE, BRANCH, JR., 414 Ponce de Leon Ave., Decatur, Ga.....	1943
HOY, NELSON D., Elmwood and Sharon Ave., Sharon Hill, Pa.....	1943
HUGHES, Dr. WALTER W., Embro, Ontario, Canada.....	1944
HUNTER, ALICE MARGARET, Box 71, R. 1, Cupertino, Calif.....	1944
JACKSON, H. PEPPER, P. O. Box 1616, Tulsa 1, Oklahoma.....	1944
JACKSON, SIDNEY JOSEPH, Longwood Towers, Brookline, Mass.....	1944
JOHANSEN, PVT. NORMAN, Headquarters Battery, 214 AAA, Gun Bn., A. P. O. c/o Postmaster, New York, N. Y.....	1944
KENYON, KARL W., U. S. N. R., 454 Ravina St., LaJolla, Calif.....	1943
KLAUCK, EDWARD C., 3875 Waldo Ave., New York 63, N. Y.....	1944
KLEINMAGD, RUTH, 119 Prospect Ave., Shelton, Conn.....	1944
KOMOROWSKI, GEORGE S., 240 E. 199th St. Bronx, New York, N. Y.....	1944
KRITZLER, HENRY, 3627 216th St., Bayside, N. Y.....	1943
LA DOW, ARTHUR C., 17 N. Girard St., Woodbury, N. J.....	1944
LANDERS, DONALD JOSEPH, 13443 Merl Ave., Lakewood 7, Ohio.....	1944
LANG, EDWARD B., Montclair, N. J.....	1943
LAWRENCE, Dr. HOMER E., Bethel, Maine.....	1944
LINDSEY, DR. ALTON ANTHONY, Dept. of Biology, University of New Mexico, Albuquerque, N. M.....	1944
LLOYD, MONTE B., Oakdale, Iowa.....	1944
LOGAN, ROBERT FULTON, 939 Pequot Ave, New London, Conn.....	1943
LOVINGOOD, DR. FRANK SMITH, Jefferson Hospital, 910 Pine St., Philadelphia, Pa.....	1944
LUM, MISS ELIZABETH C., 4006 21st N. E., Washington, D. C.....	1943
LYNCH, MAUREEN K., 530 Yale St., Palo Alto, Calif.....	1944
MCCLELLAN, ———, 4343 Adams St., San Diego, Calif.....	1944
MCDANIEL, ROBERT W., 8100 Jefferson, Apt. 305D, Detroit, Mich.....	1944
MCGREEN, DANIEL S., 144 Garfield Ave., Waukesha, Wis.....	1944
McHENRY, DONALD H., Nat. Park Service, U. S. Dept. Interior, Washington, D. C.....	1944
McNEILL, JOHN T., JR., 800 W. Fisher Ave., Philadelphia, Pa.....	1944
MARPLES, PROV. B. F., Otago University, Dunedin, New Zealand.....	1944
MARSHALL, RAYMOND O., R. F. D. 2, Columbiana, Ohio.....	1944
MARSHALL, TERELL, 1619 W. 20th St., Little Rock, Ark.....	1944
MASON, EDWIN A., Arcadia Wildlife Sanctuary, Easthampton, Mass.....	1943
MATHER, GILBERT, 226 Walnut St., Philadelphia, Pa.....	1944
MELLOR, JOHN BROOKS, Severn, Maryland.....	1944
METCALF, PVT. ROBERT, A. S. N., 39327353, N. S. C. H., A. P. O. c/o PM San Francisco, Calif.....	1943
MEYER, DR. HENRY, 1726 Dandridge Ave., Knoxville, Tenn.....	1944
MILLER, THOMAS, 1809 Bushnell Ave., South Pasadena, Calif.....	1944
MONTGOMERY, CARL EDWIN, R. F. D. 1, Alburtis, Pa.....	1944
MORRIS, MRS. ELIZABETH F., Cottage 48, Buck Hill Falls, Pa.....	1943
MOORE, MILTON, 26 Prospect Drive, Redlands, Calif.....	1943
MURPHY, ELIZABETH JEAN, 116 Jefferson Drive, Mt. Lebanon 16 (Pittsburgh 16), Pa.....	1944
NEWMAN, ROBERT JAMES, 4627 Spruce St., Philadelphia, Pa.....	1943
O'CONNOR, MISS ESTER L., 4344 Locust St., Kansas City 4, Mo.....	1944
PACKARD, CHRISTOPHER MOORE, R. F. D. 1, Box 37, Brunswick, Maine.....	1944
PARKS, G. HAPGOOD, 99 Warrenton Ave., Hartford, Conn.....	1943

PERRY, MRS. GEORGE N., Willimantic 2, Conn.....	1944
PHILIP, HARVEY E., 511 Dunbar Ave, Waukesha, Wis.....	1943
POMEROY, WILLIAM ROBERT, Cedar Knoll, Camden, S. C.....	1943
POWELL, ROGER WARREN, Lincoln Auto Court, Cheyenne, Wyo.....	1944
PRESTON, RALPH C., 90 E. Stratford Ave., Lansdowne, Pa.....	1943
PRICE, HOMER T., Payne, Ohio.....	1943
RAKER, REV. CONRAD, Good Shepherd Home, Allentown, Pa.....	1943
RAMSEY, JAMES, Greenville, R. 6, Mercer County, Pa.....	1944
RAMOS, PROF. J. A., University of Puerto Rico, Mayaguez, Puerto Rico.....	1944
RAWLINGS, WILLIAM HERBERT, 271/2 Sources Rd., Strathmore, Montreal 33, Quebec, Canada.....	1944
RENNECKAR, MISS GERTRUDE, Smithville, Ohio.....	1943
REID, H. L., Dixie College, St. George, Utah.....	1943
RITCHIE, ROBERT CHARLES, 250 Riverside Drive, Toronto, Ontario, Canada..	1944
ROBBINS, CHANDLER S., Patuxent Research Refuge, Bowie, Md.....	1944
ROBERTS, BERTRAND, 2318 Ashmead Place, Washington, D. C.....	1944
RODDIS, RICHARD, 4420 Braeburn Rd., San Diego 4, Calif.....	1944
ROMEY, JAMES R., 7, Yakima, Wash.....	1944
ROSE, GILBERT L., 128 Sheldrake Blvd., Toronto, Ontario, Canada.....	1944
ROSS, R. B., JR., 367 Metcalfe Ave., Westmount, P. 2, Canada.....	1943
ROTH, MISS RUTH, 412 S. 18th St., Allentown, Pa.....	1943
ROLLIN, NOBLE, Primrose Cottage, Glanton, Northumberland, England.....	1943
SALYER, J. CLARK, III, Fish and Wildlife Service, Merchandise Mart, Chicago, Ill.....	1943
SAMS, JAMES RIGGS, 4348 Hildale Rd., San Diego 4, Calif.....	1944
SAVORY, WILLIAM J., 200 Wiechmann Ave., Oreland, Pa.....	1944
SCHAUB, MRS. MARY J., Isabelle St., Wilmette Ill.....	1943
SCHUMM, WILLIAM G., 302 "C" St., LaPorte, Indiana.....	1944
SCOTT, Frederic Robert, 4600 Coventry Rd., Richmond 21, Va.....	1943
SEEBER, EDWARD S., 1854 Kenmore Ave., Buffalo, N. Y.....	1943
SHERPHARD, JOHN LAURENCE, Gen. Del., Banff, Alberta, Canada.....	1944
SHERER, FRANK A., Buck Hill Falls, Pa.....	1944
SKARRITT, GRACE V., 13533 Roselawn Ave., Detroit, Mich.....	1944
SMALLEY, JAMES, 485 Fairview Rd., Highland Park, Ill.....	1944
SMITH, HARRY ROY, 809 Michigan Ave. Evanston, Ill.....	1944
SMITH, NORMAN LEE, c/o Binney and Smith, 41 E. 42 St., New York, N. Y. .	1944
SMITH, DR. RALPH A., San Jose State College, San Jose, Calif.....	1944
SMITH, ROBERT L., R. 1, Reynoldsville, Pa.....	1944
SNYDER, MISS DOROTHY E., 192 Bartlett Ave., Pittsfield, Mass.....	1943
SOUTHAM, HERBERT H., 62 Laing St., Toronto, Ontario, Canada.....	1943
SPIKER, CHARLES J., Branchport, N. Y.....	1943
STEARNS, EDWIN I., 92 Farragut Rd., North Plainfield, N. J.....	1944
STEVENS, ROBERT DALE, 88 Appleton St., Cambridge, Mass.....	1943
STEVENS, O. A., State College Station, Fargo, N. Dak.....	1943
STOEHR, REV. EDWIN, St. Peter and St. Paul Monastery, Cumberland, Md...	1943
STONER, MRS. C. BIRCH, 357 Hobart Ave., Short Hills, N. J.....	1944
STONER, MRS. DAYTON (LILLIAN C.), New York State Museum, Albany, N. Y.	1944
STOTT, KENHELM WELBURN, JR., 1724 Guizot St., San Diego 7, Calif.....	1944
STROMGREN, CARL, 609 Seventeenth St., Sioux City 18, Iowa.....	1944
STRUNK, WILLIAM FRANKLIN, 700 Madison Ave., Morgantown, W. Va.....	1944

STURDEVANT, CARLETON A., R. F. D. 1, Plattsburg, N. Y.....	1943
TANGUAY, REV. ABBE RENE, Ste. Anne's College, Ste. Anne de la Pocatiere, Kamouraska Co., Quebec, Canada.....	1944
TAYLOR, JOSEPH, Allen's Creek Road, Rochester, N. Y.....	1943
TERRES, J. KENNETH, Trumansburg, R. D. 3, N. Y.....	1944
THOMPSON, GUY A., JR., Rosedale, Miss.....	1944
THORP, MISS HEATHER G., Buffalo Museum of Science, Buffalo, N. Y.....	1943
THORSELL, RICHARD S., 203 E. Blackwell St., Dover, N. J.....	1944
TUCKER, ROBERT E., 245 N. Auburndale St., Memphis, Tenn.....	1944
UNGEMA, ROBERT K., Treas. E. B. B. A., 10 Jackson Ave., White Plains, N. Y.	1943
VAN ESELTINE, WILLIAM PARKER, 209 Lewis St., Geneva, N. Y.....	1944
VAN VORST, NELLE G., 8 Swan St., Schenectady 7, N. Y.....	1944
VAURIE, AUGUSTE JEAN CHARLES, 5 E. 53rd St., New York, N. Y.....	1944
WARE, PROF. ROBERT E., Clemson State Agriculture College, Clemson, S. C...	1943
WARNER, MRS. MIKELL WORMELL, 2238-C Lauulu Place, Honolulu, T. H....	1944
WERNICKE, MRS. J. P. (MALEYA MOORE) Gull Pt., Escanaba Co., Fla.....	1944
WHITE, CLAUDE, 940 W. 6th St. Plainfield, N. J.....	1943
WHITE, NELSON COOKE, Waterford, Conn.....	1943
WIGGIN, HENRY TAYLOR, 151 Tappan St., Brookline, Mass.....	1944
WILLIAMS, CECIL S., Fish and Wildlife Service, Brigham City, Utah.....	1943
WILLIAMS, GEORGE G., The Rice Institute, Houston, Texas.....	1944
WINES, E. IRVING, 557 Nelson St., Chambersburg, Pa.....	1944
WOLCOTT, JAMES N., JR., 18 Buttonwood Ave., Eatontown, N. J.....	1943
WOLCOTT, JAMES NELSON, 18 Buttonwood Ave., Eatontown, N. J.....	1944
WORK, TELFORD H., 2180 Washington St., San Francisco 9, Calif.....	1944
WYLLIE, WILLIAM, The Brooks Bird Club, Fifth St., Warwood, Wheeling, W. Va.	1944
YANDELL, SGT. RALPH E., USMCR, VMSB 343, Group 34, Marine Air Station, Greenville, N. C.....	1944

## DECEASED MEMBERS

During the year the Union lost 26 members by death: 4 Honorary Fellows, 4 Members and 18 Associates.

EDWARD CHARLES STUART BAKER, Honorary Fellow, 1920 (1918), aged 79, died at Upper Norwood, England, April 16, 1944 (Auk, 62: 172, 1945).

DR. CARL EDUARD HELLMAYR, Honorary Fellow, 1911 (1903), died at Orselina, near Geneva, Switzerland, February 24, 1944 (Auk, 61: 616-622, 1944).

WILLIAM LUTLEY SCLATER, Honorary Fellow, 1917 (1906), aged 81, was killed by a rocket bomb, London, England, July 9, 1944.

HARRY FORBES WITHERBY, Honorary Fellow, 1928 (1921), aged 70, died at Cobham near Woking, Surrey, England, December 11, 1943 (Auk 61: 505-506, 1944).

DR. DAYTON STONER, Member, 1935 (1922), aged 60, died at Albany, New York, May 8, 1944. (Auk, 62: 172-173, 1945).

JOHN FLETCHER STREET, Member, 1928 (1908), aged 64, died at Philadelphia, Pennsylvania, September 18, 1944.

GEORGE HAY STUART III, Member, 1928 (1913), aged 72, died at Villa Nova, Pa., July 10, 1944.

DR. CHARLES HASKINS TOWNSEND, Member, 1901 (1883), aged 84, died at Miami, Florida, January 28, 1944.

HUGH BIRCKHEAD, Associate, 1936, of New York City, was killed in action in France, November 13, 1944.

- JOHN CLAUDE BRALY, Life Associate, 1926, died at De Poe Bay, Oregon, Nov. 8, 1944.
- STEWART HENRY BURNHAM, Associate, 1919, died at Ithaca, New York, Sept. 1943.
- MISS ANGIE CLARA CHAPIN, Life Associate, 1896, died at Ann Arbor, Michigan, about 1941.
- MRS. FRANK MICHLER CHAPMAN, Associate, 1908, aged 84, died at Asheville, N. C., September 22, 1944.
- CHESTER SESSIONS DAY, Honorary Life Associate, 1897, aged 77, died at Brookline, Massachusetts, January 31, 1944 (Auk 61: 507-808, 1944).
- REV. CAREY ELLIS GREGORY, Associate, 1922, died at Morganton, North Carolina, April 5, 1944.
- DR. WILLIAM ELLERY HUGHES, Associate, 1920, aged 87, died at Philadelphia, Pa., March 16, 1944.
- DR. WILLIAM CEPHAS HERMAN, Associate, 1921, aged 71, died at Cincinnati, Ohio, October 24, 1944 (Auk 62: 174, 1945).
- DR. LOMBARD CARTER JONES, Associate, 1917, died at Falmouth, Mass., Aug., 1944.
- OTTO MCCREARY, Associate, 1932, aged 64, died at Mesa, Arizona, January 6, 1944.
- GEORGE M. RIDDICK, Associate, 1943, died at Portland, Oregon, Dec., 1944.
- DR. WILLIAM EMERSON RITTER, Associate, 1929, died at Berkeley, California, January 10, 1944.
- PILOT OFFICER RONALD WARD SMITH, Associate, 1932, was killed in active service while flying overseas, September 11, 1944.
- JOHN WILLIAM STACY, Associate, 1942, aged 72, died at San Francisco, California, October 16, 1943 (Auk 61: 343, 1944).
- EUSTACE LOWELL SUMNER, SR., Associate, 1938, aged 72, died at Berkeley, Calif., Oct. 1, 1943.
- MRS. LOUIS ROBERT TAYLOR, Associate, 1935, died at Milwaukee, Wis., March 14, 1944.
- 2ND LT. PHILIP C. WALTON, Associate, 1938, aged 33, died of wounds in France, June 13, 1944.



## FINANCIAL REPORT OF THE TREASURER FOR THE YEAR ENDED SEPTEMBER 30, 1944

## ASSETS

Cash.....		\$ 740.12
Bond—Canadian 5th Victory Loan.....		500.00
Accounts Receivable		
Amounts Due:		
Year ended September 30, 1944.....	\$ 133.60	
Prior to October 1, 1943.....	100.43	
		<hr/>
	\$ 234.03	
Less: 10% Reserve.....	23.40	
		<hr/>
		210.63
Inventory at Cost:		
1931-1940 Auk Index.....	\$2,025.58	
Less: Subscriptions Paid.....	758.45	
		<hr/>
	\$1,267.13	
Other Publications.....	25.00	
		<hr/>
		1,292.13
		<hr/>
<i>Total Assets</i> .....		<u>\$2,742.88</u>

## LIABILITIES AND NET WORTH

Liabilities:		
Dues Collected in Advance.....	\$ 73.00	
Restricted Funds:		
Brewster Fund.....	\$ 282.30	
Ruthven Deane Fund.....	181.30	
Bird Protection Fund.....	37.23	
		<hr/>
		500.83
		<hr/>
<i>Total Liabilities</i> .....	\$ 573.83	
Net Worth.....		2,169.05
		<hr/>
<i>Total Liabilities and Net Worth</i> .....		<u>\$2,742.88</u>

## RECEIPTS AND DISBURSEMENTS

Receipts:		
Membership Dues:		
Fellows.....	\$ 190.40	
Members.....	468.48	
Associates.....	3,777.92	
		<hr/>
		\$4,436.80
Life Membership Fees.....		225.00
Subscriptions to 'The Auk':		
Associates-elect.....	\$ 315.00	
Educational Fund (By exchange).....	72.00	
Institutions.....	745.04	
Other Individuals.....	54.09	
		<hr/>
		1,186.13

## Sale of Publications:

Back numbers of 'The Auk'.....	\$ 474.46	
1931-1940 Index.....	166.60	
Previous indices.....	4.00	
Check-Lists.....	11.10	
Authors' reprints.....	151.70	
'50 Years of Progress'.....	1.00	
Miscellaneous income.....	1.18	
Extra number.....	1.00	
	<hr/>	\$ 811.04

## Contributions to:

Publication of 'The Auk'.....	\$ 450.00	
General expense.....	40.40	
Purchase of war bonds—stamps.....	18.75	
	<hr/>	509.15

## Income from Investments:

General Endowment Fund.....	\$ 669.69	
William Brewster Fund.....	282.30	
Ruthven Deane Fund.....	181.30	
Educational Fund.....	17.94	
Bird Protection Fund.....	37.23	
Bond interest.....	10.00	
Bank interest.....	1.14	
	<hr/>	1,199.60

Total receipts.....	\$8,367.72
Cash at October 1, 1943.....	1,286.76
	<hr/>
	<u>\$9,654.48</u>

## Disbursements:

Publishing and handling of 'The Auk'		
Manufacture and distribution.....	\$6,373.30	
Editor's honorarium.....	600.00	
Reserve stock of Publications—services, postage, supplies.....	93.81	
Purchase of back numbers.....	72.90	
	<hr/>	\$7,140.01

## Expenses of Treasurer and Business Manager:

Secretarial service.....	\$ 380.25	
Office expenses and supplies.....	55.81	
Postage and express.....	53.77	
Telephone and telegraph.....	7.66	
Bank charges and Foreign Exchange.....	31.02	
Miscellaneous.....	28.00	
	<hr/>	556.51

## Expenses of Secretary:

Secretarial service.....	\$ 76.40	
Postage, mailing and telephone.....	26.22	
Printing and supplies.....	36.91	
	<hr/>	139.53

Additions to Principal of General Endowment Fund....	456.25
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Contribution:	
Zoological Society of London .....	\$ 50.00
Miscellaneous:	
Educational Fund (By Exchange) .....	\$ 72.00
Purchase of bond—Canadian 5th Victory Loan .....	500.00
Accrued interest on bond .....	.06
	<hr/> 572.06
Total disbursements .....	\$8,914.36
Cash at September 30, 1944 .....	740.12
	<hr/> \$9,654.48

The foregoing report is extracted from a statement prepared by Morris Liebman, Certified Public Accountant, from books and other records of the late Treasurer, J. Fletcher Street, and myself. Comparisons with the figures for 1943 have been omitted, but persons interested may consult Mr. Street's report for 1943 in *The Auk*, 61 (1): 191-195, January, 1944.

JULIAN K. POTTER, *Acting Treasurer and Business Manager*

# OFFICERS AND COMMITTEES OF THE AMERICAN ORNITHOLOGISTS' UNION, 1945

	Expiration of term
PETERS, JAMES L., <i>President</i> .....	1945
WILLETT, GEORGE } <i>Vice-Presidents</i> .....	1945
LLOYD, HOYES }	
HICKS, LAWRENCE E., <i>Secretary</i> .....	1945
LINCOLN, FREDERICK C., <i>Treasurer</i> .....	1945

## ADDITIONAL MEMBERS OF THE COUNCIL

ALLEN, ARTHUR A.....	1945
DESCHAUENSEE, RODOLPHE M.....	1945
MURPHY, ROBERT C.....	1945
MILLER, ALDEN H.....	1946
GRISCOM, LUDLOW.....	1946
OBERHOLSER, H. C.....	1946
MAYR, ERNST.....	1947
RAND, A. L.....	1947
VAN TYNE, JOSSELYN.....	1947

VAN ROSSEM, ADRIAAN J., Cooper Ornithological Club Representative.....	1945
BROOKS, MAURICE G., Wilson Ornithological Club Representative.....	1945

BATCHELDER, CHARLES F., 1905-08.....	} <i>Ex-Presidents</i>
BENT, ARTHUR C., 1935-37.....	
CHAPIN, JAMES P., 1940-42.....	
CHAPMAN, FRANK M., 1911-14.....	
FISHER, ALBERT K., 1914-17.....	
FRIEDMANN, HERBERT, 1938-39.....	
WETMORE, ALEXANDER, 1926-29.....	

## EDITORIAL STAFF OF 'THE AUK'

ZIMMER, JOHN T., <i>Editor</i> .....	1945
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## BUSINESS MANAGER

LINCOLN, FREDERICK C.....	1945
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## COMMITTEES

### *Committee on Biography and Bibliography*

PALMER, T. S., <i>Chairman</i>	
KNAPPEN, MISS P. M.	WADE, J. S.
WING, L. W.	

### *Committee on Bird Protection*

LINSDALE, J. M., <i>Chairman</i>	
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*Committee on Classification and Nomenclature of North American Birds*WETMORE, ALEXANDER, *Chairman*FRIEDMANN, HERBERT  
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MILLER, ALDEN H.PETERS, JAMES L.  
VAN ROSSEM, A. J.  
VAN TYNE, JOSSELYN

ZIMMER, JOHN T.

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GRISCOM, LUDLOW

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VAN TYNE, JOSSELYN

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KENDEIGH, S. C.  
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TAVERNER, P. A.*Endowment Committee*WETMORE, ALEXANDER, *Chairman*

GRISCOM, LUDLOW

MOORE, ROBERT T.

*Investing Trustees*POTTER, JULIAN K., *Chairman*

DESCHAUENSEE, R. M.

SAVAGE, JAMES

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CHAPIN, JAMES P.

VAN TYNE, JOSSELYN



DECEASED MEMBERS OF THE A. O. U.<sup>1</sup>

THE first list of members of the American Ornithologists' Union appeared in 'The Auk' for 1886 and contained the name of one deceased member. During the next five years names of deceased members were marked merely by an asterisk but in 1892 they were first brought together in a separate list with the dates of death. This arrangement was followed until 1920 and since then the list has been published only at intervals of five years. In 1930 a further change was made by including references to obituary notices, thus converting the list into a biographical index. This year the Council has ruled that an abbreviated list be published, listing the names of those deceased members whose names are not in the last list (1940) or whose obituary notices have been published since that time.—T. S. PALMER.

## FELLOWS

ALLEN, GLOVER MORRILL, '43, 163-168, por.....	Feb. 14, 1942
BROWN, NATHAN CLIFFORD, '42, 471-476, por.....	Mar. 20, 1941
*FLEMING, JAMES HENRY, '41, 1-12, por.....	June 27, 1940
*GRINNELL, JOSEPH, '42, 269-285, por.....	May 29, 1939
HERRICK, FRANCIS HOBART, Who Was Who in Amer.....	Sept. 11, 1940
HOWELL, ARTHUR HOLMES, Who Was Who in Amer.....	July 10, 1940
*MERRIAM, CLINTON HART, Science, May 29, 1942, 545-546.....	Mar. 19, 1942
RILEY, JOSEPH HARVEY, '43, 1-15, por.....	Dec. 17, 1941
SAUNDERS, WILLIAM EDWIN, '44, 345-351, por.....	June 23, 1943
*STONE, WITMER, '41, 299-313, por.....	May 23, 1939
TOWNSEND, CHARLES WENDELL, '34, 432; '35, 227-232, por.....	April 3, 1934
TRUMBULL, GURDON, '34, 310, '40, 597-598.....	Dec. 28, 1903

## FELLOWS EMERITI

ANTHONY, ALFRED WEBSTER, '41, 439-443, por.....	May 14, 1939
STEJNEGER, LEONARD HESS, '44, 201-203, por.....	Feb. 28, 1943

## HONORARY FELLOWS

BAKER, EDWARD CHARLES STUART, '45, 172.....	April 16, 1941
EVANS, ARTHUR HUMBLE, '44, 177.....	Mar. 28, 1943
HELLMAYR, CARL EDUARD, '44, 616-622, por.....	Feb. 24, 1944
JOURDAIN, FRANCIS CHARLES ROBERT, '40, 445.....	Feb. 27, 1940
LÖNNBERG, AXEL JOHAN EINAR, '44, 177-178.....	Dec. 21, 1942
LYNES, HUBERT, R. N. '43, 482-483.....	Nov. 10, 1942
PYCRAFT, WILLIAM PLANE, '43, 312.....	May 1, 1942
REICHENOW, ANTON, '42, 464.....	July 6, 1941
SCLATER, WILLIAM LUTLEY.....	July 7, 1944
WITHERBY, HARRY FORBES, '44, 505-506.....	Dec. 11, 1943

## CORRESPONDING FELLOWS

ASHBY, EDWIN, '43, 132.....	Jan. 8, 1941
BARTLETT, EDWARD, '44, 504.....	April, 1908
BATES, GEORGE LATIMER, '43, 133.....	Jan. 31, 1940

<sup>1</sup> Figures immediately following names indicate references to biographical sketches in 'The Auk' or in a few cases to other publications. An asterisk (\*) indicates a former President of the Union.

BLAAUW, FRANZ ERNST, '44, 504-505	Jan. 17, 1936
BRINDLEY, MAUD HAVILAND (MRS. HAROLD HULME BRINDLEY) '43, 133-134	April 3, 1941
BUREAU, LOUIS MARCELLIN, Ibis, 1938, 158-159	Dec. 14, 1936
HOWARD, HENRY ELIOT, '41, 443	Dec. 26, 1940
LA TOUCHE, JOHN DAVID DIGUES, '36, 370-371	May 6, 1935
MENZBIER, MICHAEL ALEXANDROVICH, '44, 505	Oct. 10, 1935
PHILLIPS, MONTAGU AUSTIN, '43, 312-313	Jan. 11, 1939
RIBEIRO, ALIPIO DE MIRANDA	Jan. 8, 1939
RINGER, FREDERIC	Oct., 1922 <sup>1</sup>
SNOUKAERT VON SCHAUBURG, RENÉ CHARLES EDUARD GEORGES JEAN, '43, 313	Aug. 20, 1936
STEINBACHER, FRIEDRICH, '43, 134	Feb. 15, 1938
TICEHURST, CLAUD BUCHANAN, '41, 443-444	Feb. 17, 1941
TURNER, EMMA LOUISA, '43, 134-135	Aug. 3, 1940

## MEMBERS

BAILEY, VERNON ORLANDO, Science, July 3, 1942, 6-7	April 20, 1942
BARLOW, CHESTER, '03, 92-93	Nov. 6, 1902
BOND, FRANK, '44, 685-686	July 22, 1940
BOWLES, JOHN HOOPER, '35, 489-490	Feb. 2, 1934
BRAND, ALBERT RICH, '41, 444-448	Mar. 28, 1940
CHRISTY, BAYARD HENDERSON, '44, 178-179	June 20, 1943
GAULT, BENJAMIN TRUE	Mar. 20, 1942
HUBER, WHARTON, '43, 313-314	Mar. 13, 1942
JUDD, SYLVESTER DWIGHT, '42, 464-467	Oct. 22, 1905
KENNARD, FREDERIC HEDGE, '37, 234, 341-348	Feb. 24, 1937
MACKAY, GEORGE HENRY, '43, 314-315	Jan. 16, 1937
MAILLIARD, JOHN WARD, '44, 338	Jan. 9, 1936
MOFFITT, JAMES, '43, 634-636	July 2, 1943
NORTON, ARTHUR HERBERT, '43, 315-317	Jan. 5, 1943
PEARSON, THOMAS GILBERT, Autobiography, 'Adventures in Bird Protection,' 1937	Sept. 3, 1943
PENARD THOMAS EDWARD, '37, 232-234	Oct. 27, 1936
SHERMAN, ALTHEA ROSINA	April 16, 1943
SHIRAS, GEORGE, 3RD, '44, 506	Mar. 24, 1942
STEPHENS, FRANK, '38, 313-314	Oct. 5, 1937
STONER, DAYTON, '45, 172-173	May 8, 1944
STREET, JOHN FLETCHER	Sept. 18, 1944
STUART, GEORGE HAY, 3RD	July 10, 1944
SWALES, BRADSHAW HALL, '28, 264, 321-329, por.	Jan. 23, 1928
SWENK, MYRON HARMON, '43, 132	July 17, 1941
TOWNSEND, CHARLES HASKINS, Who Was Who in Amer.	Jan. 28, 1940
WARREN, EDWARD ROYAL	April 20, 1942
WILLIAMS, ROBERT WHITE, '41, 135-136	Sept. 19, 1940
WOOD, CASEY ALBERT, '42, 611-612	Jan. 26, 1942
WOOD, NORMAN ASA, '44, 179-180	Sept. 7, 1943

<sup>1</sup> Date of transfer to Deceased List by order of Council. Date of death unknown (see Auk, 40: 116, footnote, 1923).

## ASSOCIATES

ABBOTT, HARRIET.....	July, 1943
ADAMS, BENJAMIN.....	April, 1938
ALLEN, AMELIA SANBORN (MRS. JAMES TURNER ALLEN).....	Feb. 15, 1945
ARMSTRONG, EDWARD ELTON, '30, 459-460.....	April 29, 1930
ASPINWALL, JEANNETTE SCOVILL (MRS. CLARENCE AIKIN ASPINWALL) '44, 339	Dec. 24, 1934
BADÉ, WILLIAM FREDERIC, Who Was Who in Amer.....	Mar. 4, 1936
BAIRD, LUCY HUNTER, '43, 483-484.....	June 19, 1913
BARRETT, FREDERICK H.....	Dec. 3, 1939
BEICK, WALTER, '44, 180-181.....	Mar. 25, 1935
BICKNELL, CARRIE ELIZABETH FARGO (MRS. FREDERICK THOMPSON BICKNELL) '36, 374.....	June 17, 1934
BIDDLE, EMILY WILLIAMS.....	Nov. 15, 1931
BILL, CHARLES, '41, 135-136.....	April 14, 1897
BIRCKHEAD, HUGH.....	Nov. 13, 1944
BLAKE, MRS. EDWIN TYLER.....	Oct. 6, 1936
BLOOMFIELD, SARAH LUCY COLLIER (MRS. CHARLES CUNNINGHAM BLOOMFIELD) '43, 484.....	Feb. 3, 1941
BRACKEN, EMILY ROBINSON (MRS. HENRY MARTYN).....	Feb. 3, 1940
BRALY, JOHN CLAUDE.....	Nov. 8, 1944
BURGESS, JOHN KINGSBURY, '44, 507.....	Dec. 10, 1941
BURNETT, LEONARD ELMER, '44, 509-510.....	Mar. 16, 1904
BURNETT, WILLIAM LEWIS, '44, 339.....	July 5, 1934
BURNHAM, E. H.....	Sept., 1943
BURNHAM, STEWART HENRY.....	Sept., 1943
CASH, HARRY ALVIN, '44, 510.....	Jan. 11, 1928
CHAPIN, ANGIE CLARA.....	Aug. 27, 1937
CHAPMAN, FANNIE M. BATES EMBURY (MRS. FRANK MICHLER CHAPMAN)	Sept. 22, 1944
CLAY, MARCIA B.....	Mar. 11, 1941
CLINGMAN, GEORGE FRANKLIN, '45, 173.....	Feb. 3, 1933
CLOUT, GEORGE JOHN, '43, 484-485.....	May 11, 1941
COE, WILLIAM WELLINGTON, '44, 510-511.....	April 26, 1885
CRAIGHILL, FRANCIS HOPKINSON.....	Oct. 14, 1941
CROSS, ALBERT ASHLEY, '41, 448.....	April 15, 1940
CUMMINGS, EMMA GERTRUDE, '43, 317-318.....	Oct. 12, 1940
CUTLER, IRA EUGENE, '42, 141, '44, 339.....	May 25, 1936
DAVENPORT, ELIZABETH BRAXTON SIMPSON (MRS. ALONZO COOK DAVENPORT) '35, 355.....	Aug. 28, 1934
DAVIS, HENRY WASSON.....	Nov. 24, 1932
DAY, CHESTER SESSIONS, '44, 507-508.....	Jan. 31, 1944
DENNIS, LABAN, '44, 340.....	Nov. 18, 1925
DIXON, FREDERICK J., '33, 153.....	Dec. 16, 1927
EMERSON, WILLIAM OTTO.....	Dec. 24, 1940
EMLEN, ARTHUR COPE, '41, 613.....	Jan. 26, 1941
ERNSBERGER, MILLARD CLAYTON.....	Jan. 25, 1940
FARQUHAR, ARTHUR, '44, 340.....	Feb. 21, 1920
FISHER, RICHARD THORNTON, Who Was Who in Amer.....	June 9, 1934
FOSTER, FRANK BRISBIN.....	Nov. 26, 1940

FRANCIS, NATHANIEL ATWOOD, '44, 511.....	June 10, 1921
FRAZIER, JOSEPH FRANKIN.....	Mar. 30, 1940
FREEMAN, HARRIET ELIZABETH, '44, 686.....	Dec. 30, 1930
FULLER, HENRY CORBIN, '43, 136.....	Aug. 26, 1942
GILBERT, ROBERT A., '42, 467.....	Jan. 7, 1942
GRANGER, WALTER WILLIS, '42, 140.....	Sept. 6, 1941
GRANT, WILLIAM WRIGHT.....	Oct. 25, 1942
GREGORY, CARRY ELLIS.....	April 5, 1944
GRESHAM, ALBERT BURTON, '44, 511-512.....	Dec. 24, 1941
GROELLNER, EUGENE O.....	Aug. 18, 1941
HAMBLETON, JAMES CHASE, '42, 141.....	July 6, 1938
HATCH, JESSE MAURICE, '44, 686.....	May 1, 1898
HENDERSON, JOHN BROOKS, Who Was Who in Amer.....	Jan. 4, 1923
HENSHAW, SAMUEL.....	Feb. 5, 1941
HENSYL, GEORGE STANFORD.....	July 27, 1942
HERMAN, WILLIAM CEPHAS, '45, 174.....	Oct. 24, 1944
HERRICK, HAROLD, Who Was Who in Amer.....	May 27, 1933
HILL, JAMES HAYNES, '44, 687.....	Dec. 11, 1922
HILL, WILLIAM HENRY, Who Was Who in Amer.....	Oct. 14, 1913
HIX, GEORGE EDWARD, '42, 467-468.....	Nov. 23, 1941
HOFFMAN, EDWARD CARLTON.....	Mar. 18, 1941
HOMER, FRED LEROY, '43, 485-486.....	Sept. 26, 1930
HOWELLS, GERTRUDE W.....	Aug., 1939
HUGHES, WILLIAM ELLERY.....	Mar. 16, 1944
INGALLS, CHARLES EDWARD, '41, 136.....	May 31, 1917
JAMES, NORMAN, '44, 512.....	Jan. 24, 1939
JOHNS, ERWIN WILLIAM.....	Mar. 24, 1940
JOHNSON, CHARLES EUGENE, Who Was Who in Amer.....	June 6, 1936
JONES, LOMBARD CARTER.....	Aug., 1944
JORDAN, ALVAH HENRY BEDELL, '43, 136-137.....	May 31, 1942
KELKER, WILLIAM ANTHONY, '45, 174.....	Feb. 15, 1908
KENT, EDWARD GRUETT, '43, 318.....	Mar. 24, 1940
KENT, EDWIN CLARK, '42, 142.....	July 11, 1942
KLOSEMAN, JESSIE EMMA, '41, 449.....	Oct. 25, 1940
KNICKERBOCKER, CHARLES KENNEDY, '43, 633.....	Jan. 7, 1940
LADD, SAMUEL BRAGG, '44, 687.....	Sept. 26, 1931
LANGELIER, GUSTAVE ADOLPHE, '41, 449.....	April 23, 1940
LAURENT, PHILIP.....	June 17, 1942
LEMON, FRANK EDWARD, '44, 340.....	April 22, 1935
LEWIS, MERRIAM GARRETSON, '41, 450.....	Jan. 5, 1941
LYON, MARCUS WARD, JR., '43, 633-634.....	May 19, 1942
MABBETT, GIDEON, '41, 613-614.....	Aug. 15, 1890
MAIN, JOHN SMITH, '43, 318.....	Nov. 13, 1940
MALLOY, FRANK JOSEPH.....	Feb. 16, 1942
MARESI, POMPEIO MARGHERITA.....	Aug. 12, 1940
McADAMS, CLARK, Who Was Who in Amer.....	Nov. 29, 1935
McCLANAHAN, ROBERT CHARLES, '44, 181.....	May 6, 1943
MCCREARY, OTTO C.....	Jan. 6, 1944
MELCHER, MRS. CHARLES WOODBURY.....	Dec., 1941
MERSHON, WILLIAM BUTTS, '44, 508-509.....	July 12, 1943



MORE, ROBERT LEE, '42, 468.....	Sept. 6, 1941
MORRIS, LEWIS RUTHERFORD, '45, 174-175.....	Dec. 9, 1936
MOULTHROP, PHILIP NELSON, '44, 131-132.....	Aug. 23, 1943
NICHOLS, RODMAN ARMITAGE, '40, 599.....	May 27, 1940
NOBLE, GLADWYN KINGSLEY, '41, 450-451.....	Dec. 9, 1940
NORRIS, EDWARD, '43, 318.....	Jan. 14, 1941
OASTLER, FRANK RICHARD, '44, 182.....	Aug. 2, 1936
O'BRIEN, MARY, '43, 636-637.....	Mar. 25, 1943
OGDEN, HENRY VINING, '44, 341.....	Oct. 10, 1931
OSBORN, HENRY FAIRFIELD, Who Was Who in Amer.....	Nov. 6, 1935
OSBORNE, ARTHUR AUGUSTUS.....	April 24, 1936
PALEN, FREDERICK POMEROY, Who Was Who in Amer.....	Dec. 2, 1933
PERKINS, GEORGE HENRY, Who Was Who in Amer.....	Sept. 12, 1933
PERKINS, SAMUEL ELLIOTT, III, '42, 468-469.....	Jan. 31, 1941
PHILLIP, PHILIP BERNARD, '42, 613.....	July 11, 1941
PHILLIPS, ALEXANDER HAMILTON, '42, 140.....	Jan. 20, 1937
PORTER, WILLARD BROWN.....	May 12, 1941
POTTER, LAURENCE BEDFORD, '44, 341.....	Nov. 5, 1943
PRAEGER, WILLIAM EMILIUS, Amer. Men of Science, '29, 786.....	Aug. 13, 1936
REED, CARRIE S. (MRS. CHARLES KELLER REED).....	1942
RICE, JAMES HENRY, '41, 451-452.....	Mar. 23, 1935
RICH, MARCUS CHARLES.....	Nov., 1941
RICHARDSON, RUSSELL, II, '44, 182-183.....	May 10, 1942
RIDDICK, GEORGE M.....	Dec., 1944
RITTER, WILLIAM EMERSON, Science, Apr. 23, 1944, 335-338.....	Jan. 10, 1944
ROBINSON, ANTHONY WAYNE, '43, 637.....	Nov. 29, 1939
ROLLINS, HARRY LEIGHTON.....	Mar. 27, 1933
ROSIER, EUGENE.....	1941
ROSS, GEORGE HERBERT, '43, 637.....	May 31, 1942
RUMSEY, MARY HARRIMAN (MRS. CHARLES CARY RUMSEY) '42, 142.....	Dec. 18, 1934
RUSLING, WILLIAM JAMES, '43, 486.....	Aug. 16, 1942
SAGE, HENRY MANNING, '44, 341-342.....	Sept. 25, 1933
SCHMID, EDWARD SIDNEY, '44, 342-343.....	Mar. 12, 1939
SILLIMAN, OSCAR PERRY, '44, 183-184.....	May 9, 1943
SIMONS, EDWARD ALEXANDER.....	Dec., 1939
SMALL, WILLIAM MELVILLE.....	Dec. 5, 1942
SMITH, FRANCIS.....	June 26, 1942
SMITH, FRANCIS HOPKINSON, '45, 175.....	Oct. 14, 1941
SMITH, FRANK, '42, 613-614.....	Feb. 3, 1942
SMITH, HUGH McCORMICK, '43, 483.....	Sept. 28, 1941
SMITH, RONALD WARD.....	Sept. 11, 1944
SMYTH, ELLISON ADGAR, JR., '43, 638-639.....	Aug. 19, 1941
STACY, JOHN WILLIAM, '44, 343.....	Oct. 16, 1943
STANLEY, ARTHUR CAMP, '40, 599.....	April 30, 1940
STICKNEY, GARDNER PERRY, '43, 639.....	Feb. 25, 1935
STONE, LILLIE MAY LAFFERTY (MRS. WITMER STONE).....	Aug. 3, 1940
STRECKER, JOHN KERN, '35, 491-492.....	Jan. 9, 1933
STURTEVANT, EDWARD, '44, 184.....	Jan. 16, 1939
SUMNER, EUSTACE LOWELL, Condor, '44, 37.....	Oct. 1, 1943
TAYLOR, MRS. LOUIS ROBERT.....	Mar. 14, 1944



THORNE, MRS. WILLIAM VAN SCHOONHAVEN.....	Dec. 25, 1937
THOWLESS, HERBERT LANDO, '43, 640.....	May 13, 1940
TROTTER, WILLIAM HENRY, '43, 640.....	Nov. 7, 1933
TURNBULL, JAMES DOUGLAS.....	Nov. 7, 1941
VETTER, CHARLES.....	Aug. 28, 1941
WALTON, PHILIP C.....	June 13, 1944
WANLESS, JOHN.....	July 15, 1941
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WILLARD, SAMUEL WELLS, '44, 344.....	May 24, 1887
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